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OFFICIAL AUTO WIRING GUIDE

Containing Guaranteed Correct Wiring Diagrams of Gasoline and Gasoline-Electric Automobiles

FOR GARAGE OWNERS AND MECHANICS, DEALERS, SERVICE STATIONS, TRAINING SCHOOLS, ETC.

Price \$7.50

Compiled under the direction of WILLIAM ROBERT DUDLEY, Electrical Equipment Counsel, in collaboration with Harry L. Wells and James A. King, Instructing Engineers of the INTERNATIONAL MOTOR INSTITUTE

PUBLISHED BY THE

INTERNATIONAL MOTOR INSTITUTE

Practical Expert Training by Correspondence in Automobile Repairing, Operation and Maintenance, with Special Additional Electrical Instructions; Garage Equipment and Management; Stationary and Portable Gasoline Engines; Farm Power and Lighting; Gas Tractors



CHICAGO. U. S. A.

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FOREWORD



HE Official Auto Wiring Guide is primarily for the everyday use of the automobile mechanic and repairman. It contains, in compact form, guaranteed correct wiring diagrams of all makes and models of gas cars, as well as circuits covering the control of the various makes of starting and lighting systems.

When a car is before you for repairs and you want to find a diagram showing its wiring circuits, you should note the name of the system and the model on the name plate on the starter or the generator. By referring to the index you can readily turn to the page showing the circuits covering that

particular equipment.

Should you be unable to locate the system in the index under "Miscellaneous Wiring Diagrams," turn to the index marked "Index for Cars," where you can then locate the name of the car and the diagram of the car manufacturer. It frequently happens that the engineers of the car manufacturer change the system of wiring from that laid out by the manufacturer of the starting and lighting equipment in order to better accommodate their particular model of car. However, you should be able to find any system you desire in one or the other of the indexes.

Cut-outs and magnetic devices, as well as their circuits, are shown in the index under "Miscellaneous Wiring Diagrams," which also gives the name of the company building them. In the index under "Fuses For All Makes of Cars," you will find the size of fuse to fit any car, with its ampere rating and voltage. In the index "Prints for Wiring Cars" you will find diagrams to cover various combinations or arrangements for wiring head, side, dome, tail, and dash lights, together with battery, generator, and ammeter, under the control of from one to four gang switches. In the index under "Cutler-Hammer Switches" you can locate the diagrams covering the circuits, both technical and non-technical, of any control of any switch made by that company, and for all makes of cars. Practically all cars are now equipped with these switches. These diagrams will materially assist you in wiring dimmers, circuits on head lights, etc., the laws covering which are very strict.

Supplements will be issued from time to time covering the equipment on new cars and models brought out since the publication of this volume. These supplementary diagrams can be secured by writing direct to us, from accessory jobbers or your local book dealer. These will enable you to have before you at all times

complete and up-to-date information.

INTERNATIONAL MOTOR INSTITUTE

PUBLISHERS

CHICAGO, U. S. A.



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Anderson 1917		1-50	Chevrolet 1915-1916	2
Apperson		1-50	Chevrolet Model 490	2
Arbenz			Chevrolet 1917	2
Auburn 1915			Cole 1913–1914	1
Auburn 1917			Crawford 1915	5-1
Austin			Crawford 1916–1917	2
Biddle 1917			Cunningham J 1914	1
Bour Davis 1917		1-50	Cunningham J 1915	2
Briscoe 1915			Cunningham J 1916–1917	2
Briscoe 1916–1917			Crow	2
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Cadillac 1914		250	Davis	2
Cartercar			Detroiter	1
Cartercar Model 9			Detroiter 1917	2
Cartercar 1915		1-50	Dispatch	1
Case		1-50	Dispatch 1917	1
Case 1917			Dixie	
Chadwick			Dixie 1917	
Chadwick			Dodge 1915–1916]
Chalmers 1914			Dorris	
Chalmers 1915			Dort	5
Chalmers Model 32			Dort 1916–1917	
Chalmers Model 35, 1917			Drexel 1917	2
Chalmers Model 35 1917			Elcar	1
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NAME OF CAR	AMPS	VOLTS
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Chandler 1917	20	1–50
Chevrolet 1915-1916	20	250
Chevrolet Model 490	20	1-50
Chevrolet 1917	20	1-50
Cole 1913–1914	15	1–50
Crawford 1915	5–15	1-50
Crawford 1916–1917	20	1-50
Cunningham J 1914	15	1-50
Cunningham J 1915	20	1-50
Cunningham J 1916–1917	20	1-50
Crow	20	1-50
Daniels "8" 1917	5–15	1-50
Davis	5–15	1-50
Davis	20	1-50
Detroiter	15	1-50
Detroiter 1917	20	1–50
Dispatch	10	1-50
Dispatch 1917	15	1-50
Dixie	10	1-50
Dixie 1917	10	1-50
Dodge 1915–1916	10	1-50
Dorris	15	1-50
Dort	5-15-25	1-50
Dort 1916–1917	20	1-50
Drexel 1917	20	1-50
Elcar	15	1-50
Empire 1914	5–15	1-50

GASOLINE MOTOR CARS—Continued

NAME OF CAR	AMPS	VOLTS	NAME OF CAR	AMPS	VOLTS
Empire 1915	20	250	Lexington 4	15	250
Empire 1916–1917	20	1-50	Lexington 4	5–15	1-50
Empire 1916–1917	20	250	Lexington 6	5–15	1–50
Enger	20	1-50	Lexington "6" 1917	15	1-50
Farmac	15	1-50	Lexington Super-six 1917	15	1-50
Fiat	5–15	1-50	Locomobile 1914	30	250
Fiat 1916–1917	30	250	Locomobile 1915	15	1-50
Franklin	15	1-50	Locomobile 1916–1917	10	1-50
Franklin 1917	10	1-50	Lozier	10	250
Glide 1916–1917	5–15	1-50	Lozier 4 Cyl. 1917	20	250
Grant Six	Special	1-50	Lyons-Knight 1913–1914	10	1-50
Grant 1917	20	1-50	Madison	5–15	1-50
Hal 1917	15	1-50	Marion	5–15	1-50
Haynes	15	1-50	Marmon	15	1-50
Haynes 1917	5	1-50	Master	15	1-50
Hollier Eight	Special Link Fuse		Maxwell 1914	15	1-50
Hudson 1914–1915	15	1-50	Maxwell 1915–1916–1917	20	1-50
Hupmobile 1914	5–10–15	1-50	McFarlan 76	5–15	1-50
Hupmobile 1915–1916	15	1-50	McFarlan 1917	10–30	1-50
Hupmobile 1917	10	1-50	Mercer	5	1 -50
Imperial Model 56	5	1-50	Mercer 1916–1917	30	1-50
Imperial Model 64	20	1-50	Mercer 1916–1917	5–10	1-50
Imperial Model 66-F	15	1-50	Metz	20	1-50
Imperial Model 66 1916	15	1-50	Mitchell 1913–1914	15	1-50
Jackson 1916–1917	20	1-50	Mitchell 1915	15	1-50
Jeffery 1913–1914	15	1-50	Mitchell 1916	Special Link Fuse	
Jeffery 1915	10	1-50	Mitchell 1917	20	1-50
Jeffery 1916–1917	20	1-50	Moline 1914	10	1-50
Jordan 1917	20	1-50	Moline 1915	15	1-50
King	30	1-50	Moline Model 40	20	1-50
King	10	1-50	Moline 1916–1917	20	250
Kissel Kar 1915	15	1-50	Monroe	20	250
Kissel Kar 1916–1917	20	1-50	Monroe 1916–1917	20	1-50
Knox	10–15	150	Norwalk 6	15	1-50
L. C. E	15	1-50	National 1914	15	1-50

GASOLINE MOTOR CARS—Continued

NAME OF CAR	AMPS	VOLTS	NAME OF CAR	AMPS	Vo	OLTS
National 1916	20	1-50	Simula 1015 1016			
Oakland 1916-1917		1-50	Simplex 1915–1916	10	1	1-50
Overland Model 79-83.		1-50	Simplex 1917	20		250
Overland 1914 Coupe			Simplex 1917	10	1	1-50
Overland 1916–1917.	20 20		Spaulding	1-2-3	1	1-50
Owen Magnetic 1917	10	1-50	Speedwell	15	1	1-50
Pathfinder		1-50	Standard 1916	10	1	1-50
Packard	5–15		Standard 1917	5–15		250
Packard Trucks	10	1-50	Staver	15	1	1-50
Paige	20	1–50	Stearns "4" 1916–1917	20	1	1-50
Peerless 1914.		1–50	Stearns "8" 1916–1917	20	1-	1-50
Peerless 1915		1-50	Stearns-Knight	20	1.	1-50
	20	1–50	Stearns-Knight	20	1.	1-50
	20	250	Stegeman Trucks	15	1.	1-50
Peerless 1917	10	1-50	Stephens 1917	20	1.	1-50
Peerless 1917	20	250	Studebaker 1914	15	1-	1-50
Pierce Arrow	5-10-30	1-50	Studebaker 1915	15	1-	1-50
Pope-Hartford	10	1-50	Studebaker 1916–1917	10		1-50
Pratt	20	1-50	Stutz	15		-50
Premier 1915–1916	10	1-50	Sun 1917	20		-50
Pullman	Special Link Fuse		Velie Model 15	20	1-	-50
Pullman 1917	20	1-50	Velie 1916	Special Link Fuse	<u></u> .	. 50
Regal 1914–1915	5	1-50	Wescott 1916	15		-50
Reo 1914–1915	10-15	1-50	White 1915	15		. - 50
Reo 1916–1917	5–10	1-50	White 1916	15		-50
Roamer	10	1-50	Willys-Knight	20	· · · · · · · · · · · · · · · · · · ·	250
Ross "8" 1917	20 Fuse Plug	125	Willys-Knight	15	1	-50
Saxon Six	20	1-50	Winton	10	1-	-50 -50
Saxon Six	15–30	1-50	Winton Model 21-A	5–20	1-	-50 -50
Saxon Six 1917	15	1-50	Winton 1916–1917	15		
Simplex 1915–1916	30	250	Zimmerman			-50
				15	1-	-50

LIST OF FUSES TO FIT ALL MODELS

OF

STARTING AND LIGHTING SYSTEMS

NAME OF CAR	AMPS	VOLTS	NAME OF CAR	AMPS	VOLTS	
Apelco Apperson Bijou Briggs & Stratton Dean Auto Lite Esterline Gray & Davis	10	1–50 1–50 1–50 1–50 1–50	Gray & Davis Ford 1915	20		
List of Fuses to Fit All Makes of ELECTRIC CARS						
NAME OF CAR	AMPS	VOLTS	NAME OF CAR	AMPS	VOLTS	
American Anderson 1914–1915–1916 Anderson 1917 Argo A–B–C Borland Broc Baker Bailey Century Chicago Detroit 1914	10		Detroit 1915. Dayton G. V. C. Grinnell. Hupp Yeates Ohio 1916–1917 Standard. Ward. Woods. Woods 1917	10	250 90 250 250 250 250 50 250	

PRINTS FOR RE-WIRING CARS

GROUNDED OR MULTIPLE SYSTEMS

2 Head Lights. 1 Tail Light. 6 Volt Battery. 6 Volt Generator. Controlled on 2 gang switch. Page 357	2 Head Lights. 6 Volt Battery. Tail Light	2 Head Lights auxiliary bulbs
2 Head Lights 1 Dome Light and 1 Gauge Light in series 1 Tail Light. 1 Ammeter, 15 amp. double reading 6 Volt Battery 6 Volt Generator Controlled on 4 gang switch 2 Head Lights 2 Side Lights 1 Tail Light 6 Volt Battery Page 359	2 Head Lights. 2 Side Lights. 1 Dome Lamp. 1 Tail and 1 gauge in series. 1 Ammeter 15 amp. double reading. 6 Volt Battery. 6 Volt Generator. Grounded System. Controlled on 4 gang switch.	Multiple System Controlled on 4 gang switch. 2 Head Lights 2 Side Lights 1 Tail Light 1 Search Light 6 Volt Battery 6 Volt Generator 1 Ammeter 15 amp. double reading D C. System Controlled by 2 gang switch.
6 Volt Generator. Grounded System. Controlled on 3 gang switch. 2 Head Lights. 2 Side Lights. 1 Tail Light and 1 Gauge Light in series 6 Volt Battery. 6 Volt Generator. Grounded System. Controlled on 3 gang switch.	2 Head Lights auxiliary bulbs	2 Head Lights

CUTLER HAMMER SWITCHES FOR:

INDIVIDUAL CONTROL A 2 Head Lights	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$
B Combination Lighting	THREE WIRE LIGHTING SWITCH CONTROLLING A 2 Head 1 Tail 2 Side And dimming heads by resistance
A 2 Heads by series parallel, controlled by one extra switch B 2 Heads by series parallel, control switches arranged in tandem Page 368	B Three wire switches to dim head lights by resistance
OPERATION OF A Door switch; control of dome light	A Dimming head lights by resistance, using a 12-volt battery and 6-volt lamp B Series parallel control of
$ \begin{array}{c c} A & 2 & Heads \\ 1 & Tail \end{array} \begin{array}{c} \text{or} \begin{array}{c} 2 & \text{Side} \\ 1 & Tail \end{array} \end{array} \begin{array}{c} \text{or} \begin{array}{c} 2 & Heads \\ 2 & \text{Sides}. \end{array} \end{array} \begin{array}{c} \text{Page 370} \end{array} $	COMBINATION LIGHTING GROUNDED SYSTEM WITH Large head and tail lights, or

CONSTRUCTION AND CARE OF BATTERIES

HOW A CELL IS MADE:

The inside of a storage battery cell consists of molded lead grids which are filled with a paste. The paste is made from red lead and a weakened solution of sulphuric acid for the positive (+) plate. The negative (-) plate paste is made from litharge and a weakened solution of sulphuric acid. To get this paste exactly right and treat it properly is an art, and requires time and experience. There is always an odd number of plates in a cell, due to the fact that there is one more negative plate than positive. A negative plate is put at each end so there will be action on both sides of all positive plates. The positive plates are thicker and have more active material, which is one reason for this, but the main reason is that the positive plate has a tendency to recede from the negative plate, and if it is put at the end it will buckle and bend away from the negative plate, which will press the middle of the plate through the separator, causing a short circuit. The negative plate does not have this characteristic.

All positive plates are connected by a lead strap at the top, with the terminal of this strap protruding through the top of the cell. The negative plates are connected in the same way. The positive plates are placed between the negative plates so there will be alternately a positive and negative. To prevent these

opposite plates from touching, they are kept apart by what are known as "separators." These are usually made of wood, chemically treated and ribbed for the purpose. The plate assembly then goes into the hard rubber battery jar, the bottom edges of the plates resting upon ribs protruding from the bottom of the jar. The jar is now covered and sealed with a waxy material known as battery sealing wax. There is a vent-hole left in the top of each cell with a screw cap. A solution made from chemically pure sulphuric acid and distilled water is poured into the cell through the vent-hole until the plates are covered completely.

The above describes the inside construction of one cell. The number of cells can always be determined by the number of vent-holes in the top of the battery. (There is a cell to each vent-hole). Different sized batteries have different numbers of plates. The size and number of plates determines the ampere hour capacity. Each cell gives only two volts, regardless of the size of the battery. When the battery is being charged, the voltage will rise as high as 2.5 volts per cell and sometimes higher, but as soon as the battery is put back in service, the voltage soon drops to 2 volts per cell.

When the battery is fully charged and in good condition, the positive plates have a dark reddish-brown or chocolate color, while the negatives are gray or slate-colored. The plates may also be distinguished by the material. The positive plate material is hard, like soapstone, while the negative plate material is soft, and can be easily cut into with the finger-nail. After the plates have been treated, which is accomplished by charging and discharging, the paste that was put into the grids becomes the active material of the battery. The negative material becomes a pure sponge lead, and the positive a lead peroxide.

ACTION DURING CHARGING AND DISCHARGING:

When charging a battery, the electricity is not being stored, as thought by some, or as the name would imply. The action is purely chemical, and the current which is given off is generated by chemical action.

When an electric current is drawn from a battery, the sulphuric oxide of the sulphuric acid combines with the active material on both plates to form a variety of lead sulphate. The taking of sulphuric oxide out of the acid of the solution weakens the solution, which causes the specific gravity to drop. Since "sulphate" is a term used to designate a battery in bad condition, the proper form of lead sulphate on the plates can best be understood by terming it as uncrystallized lead sulphate. What is commonly known as a "Sulphated Battery" is a battery which has been neglected until the lead sulphate on the plates has become wholly, or partly crystallized and is in a form which is difficult to turn into active material. A battery should only be discharged to where the specific gravity drops to 1150 or the voltage of each cell to about 1.7 volts.

When it is discharged to this point it should be immediately charged again.

When an electric current is passed through a discharged battery, it dissolves this uncrystallized lead sulphate on the plates, into the water of the solution, changing it back into sulphuric acid again, which raises the specific gravity. If the battery is allowed to discharge until there is no voltage, the liquid left in the cells is almost a pure water. This explains why the hydrometer reading is an indication of the state of charge of the battery. When a battery is left for a long time in a discharged condition this lead sulphate on the plates will crystallize and the battery will then be in a condition generally known as "sulphated", which really should be called "crystallized sulphated." When in this condition it can be readily understood that to change this crystallized substance back into a liquid will be very difficult, and can only be accomplished by a long, slow process of charging and discharging at a slow rate.

WHEN NEW ACID IS REQUIRED:

The constant changing of the acid in the solution to a solid, and back into a liquid, is bound to result in the loss of some acid each time, and adding more acid is necessary at times. The battery should be put on charge, and if a charging current flows, leave the battery on until it has been gassing freely for about thirty minutes to one hour, then if the gravity does not rise any inside of half an hour, and the reading is not as high as it should be (1270 specific gravity) make a solution of water and sulphuric acid with a gravity reading between 1300 and 1400. (Mix the

solution as per the table below.) Take out some of the solution in the battery and add the new solution. (Keep the battery on the Charger during the operation). Continue thus until the solution in the battery reads 1270 to 1280 specific gravity.

Sometimes batteries are allowed to discharge until there is not enough acid in the solution to cause a charging current to flow. In cases of this kind, either put in a new solution of from 1150 to 1200 specific gravity and put the battery on charge at a slow charging rate of from two to five amperes, or charge and treat as per instructions under "Charging Sulphated Batteries." It may sometimes result, in treatments of this kind, that the gravity of the solution will rise beyond 1280 or 1300 by charging and discharging. In such cases add pure water to reduce the specific gravity to 1280 or 1300.

SULPHURIC ACID-MIXTURE WITH WATER BY WEIGHTS

SPECIFIC GRAVITY	WEIGHT IN LBS. PER CUBIC FT.	PER CENT OF 1.835 ACID	LB. OF 1.835 ACID IN 1. CU. FT.	PER CENT OF 1.842 ACID
1.000 1.028 1.058 1.090 1.124 1.160 1.198 1.250 1.295	62.37 64.12 65.99 67.98 70.10 72.35 74.72 77.96 80.77 84.51	0.00 5.00 9.00 13.60 18.25 23.25 28.50 35.50 41.25 48.50	0.00 3.21 5.94 9.25 12.79 16.82 21.30 27.68 33.32 40.99	0.000 4.675 8.415 12.716 17.064 21.739 26.647 33.192 38.569 45.347
1.408	87.82	54.50	47.86	50.957

In mixing the acid solution, never pour water into the acid; always pour acid into the water. Always allow newly-made solution to cool before putting it into the battery.

CHARGING SULPHATED BATTERIES:

The above heading refers to a sulphated battery that has been allowed to crystallize to a certain extent. When a battery is in this condition it is generally best to empty the solution and rinse the cells with pure water. Make a solution of 1150 to 1200 specific gravity and connect the battery on the Charging Line.

With the sulphated battery, the charging should begin at about a two or three ampere rate and should not be allowed to rise beyond five or six amperes. A thermometer reading should be made every hour and the temperature of the solution should never be much over 100 degrees Fahrenheit. Never let it heat more than 110 degrees Fahrenheit.

When the cells begin to gas and give off bubbles, take the battery off of the Charging Line and discharge the battery by connecting some lamps on it or some resistance across its terminals. Put in just enough lamps or resistance to draw a discharge current equal to one-tenth the ampere hour capacity; (if 80 ampere hour batteries, discharge at an 8-ampere rate) discharge the battery until each cell has a voltage of 1.6 to 1.7 while the battery is discharging. Repeat this process from two to three times, when the sulphate will be well broken down and the battery in good condition.

CHARGING RATE OF BATTERIES IN GOOD CONDITION:

Batteries charged at a low rate will give much longer life than if charged at a high rate. This treatise deals only with batteries used on automobiles, and it is a rare occasion that these batteries are brought to the charging station in what the experienced battery engineer would call good condition. The reason for this is due to the way the battery has been charged on the car. The proper way to use the battery to get the most service out of it is to fully charge it and then use it until it discharges down to about 1.6 volts to the cell and then fully charge it again; that is, always use a battery until it needs re-charging, and then always fully re-charge it. On automobiles they are charged for a short space of time and then discharged for a short time, and are often undercharged. That is the reason the batteries brought to the charging station usually have some crystallized sulphate on the plates, and should be charged at a slow rate. Some car owners secure good service out of their battery and never take it to a battery station. These are very few, and the reason is that they drive their car on long trips without using their starters much and give the battery a complete charge once or twice each month, but it is safe to say that when a battery is brought to a charging station it is in need of a treatment of a long, slow charge at a low rate of not more than five or six amperes.

Most battery manufacturers charge all sized automobile starting and lighting batteries at from three to four ampere rate.

The higher rate of starting the charge is the limit. There is no objection on their part to a slower rate to begin the charge.

DO NOT BOOST CHARGE:

Discourage the high charging rate whenever possible. You will gain friends by it in the end. If a battery is charged at a high charging rate it will cause the solution to become hot, which causes the paste in the plates to fall off, weakening the output of the battery by forming a connection between the plates at the bottom. Always use a thermometer in charging, and keep the temperature of the solution about (or under) 100 degrees Fahrenheit. If it goes above this, stop the charge for awhile and allow the battery to cool, and then continue the charge.

BATTERIES THAT WILL NOT CHARGE TO A FULL SPECIFIC GRAVITY READING:

Sometimes it is experienced that the specific gravity of the battery will not rise beyond 1200 or 1250 by charging. If such a battery is charged at a high rate, the strength of the battery is impaired. The high charging current overheats the battery, causing the paste to fall out of the plates, in which case it crumbles in the bottom of the cell and weakens rather than strengthens the output of the battery. The paste falling to the bottom of the cells will in time touch the bottom of the plates, which will short-circuit the battery, causing it to consume its own strength very rapidly.

Treat these batteries as per instructions under "Charging Sulphated Batteries", and add acid if the specific gravity does not rise to 1275 after charging and discharging three times. Never put pure acid into a battery. Dilute and allow it to cool before putting in the battery. (See instructions under "When New Acid is Required").

PUTTING IN NEW SOLUTION OR NEW SEPARATORS:

When it is necessary to put in new separators, and also new solution, it will sometimes result that in charging this battery the gravity of the solution will drop rather than rise. This is due to the following causes: The separators will consume a certain amount of the strength of this acid, and as the charging process continues, the separators will be absorbing the acid instead of

making new acid from the plates. If the battery were in a discharged condition when the new separators were put in, then the charging current would make acid from the lead sulphate on the plates and would raise the gravity of the solution instead of lowering it, but in most cases you will find that the solution either drops, or remains as it was. Charging does not have much effect on cases of this kind.

If the storage battery is in a charged condition, and a new solution be put into it, it will also be impossible to bring the specific gravity up by charging. It will stay as when first put in, or fall off slightly. This is because there is no lead sulphate on the plates for the electrical current to change back into an acid solution. In cases of this kind, the original solution put in the battery should show a specific gravity between 1275 to 1300.

REPAIRING AND OVERHAULING STORAGE BATTERIES

The storage battery on an automobile, whether it is used for self-starting or electric lighting, must be given as much care as any other part of the car, if not more. Although the ordinary automobilist does not know much about the battery on his car, he thinks he is doing all that is necessary by only adding enough distilled water to keep the plates covered. Now, at the end of, say, six months, his battery starts giving him trouble, and he takes it to a battery repair man and shows him that the positive plates are worn out. He cannot understand why such a thing should happen. He has been taking such good care of his battery, always seeing that there was sufficient solution in each cell to cover the plates, and now he is told that the battery is defective either has a short circuit, or the positive plates have all crumbled apart. Someone has told him that all he had to do was to keep sufficient solution in each cell so that the plates are covered. Now let us see what he should have done to have kept this battery in a better condition.

HOW A BATTERY SULPHATES:

A storage battery, when standing idle for a few days or a week, should always be fully charged. When left discharged, the chances are that the plates will sulphate for this simple reason: When a battery is fully discharged, the active material on the

negative plate has changed to a lead sulphate and the active material on the positive plate has changed to a lead sulphate, there is no difference of potential or any spark between the terminals of the two plates for the simple reason that each plate consists of the same material. If this fully discharged battery were allowed to stand for a short time in this discharged condition, the acid is continually acting on this lead sulphate which is on the two plates, and changes it to a hard insulating substance which we shall call "crystallized lead sulphate."

WHY PLATES BUCKLE:

If the battery is allowed to remain in a discharged condition until all the lead sulphate on the plates crystallizes, the electrical current will not be able to work it off. This crystallized sulphate does not cover the plates evenly, but only in spots. That part on the plates where the sulphate is not crystallized, will receive its charge and become heated. This unequal heat on the plates causes one part to expand more than the other, and this unequal expansion causes the active material or paste to fall out, or the plate will buckle or warp. If the plate is warped, it will not take long to wear through the thin separators and touch the negative plate, causing a short circuit and the cell to discharge itself. No matter how long you charged this cell, it will not retain the charge.

Warping of the plates will sometimes cause the cell to leak. The warping requires more space and pushes against the cell, and the strain cracks the brittle, hard rubber of which the cell is made.

If it is necessary to allow a battery to stand for a short time, always leave it in a fully charged condition, then the internal action will not be so great.

From what has been said, you can understand why it is injurious to a battery to work it when it is almost discharged. When the charge in the battery is not sufficient to start the car, it should be given a full charge. The battery cannot be fully charged on the car, unless the car is run continuously for 20 hours.

HOW TO LOCATE BATTERY TROUBLE:

If the battery does not operate the self-starter or light the lights bright, it does not always mean that the battery is discharged. Perhaps the acid has corroded the terminals, especially the positive one. Always be sure that you have clean connections, then cover the cleaned surface with vaseline to protect it from the acid.

Every automobilist who has a battery on his car should have an acid hydrometer, for with it he can tell exactly the amount of charge in the battery. The solution in the battery, when fully discharged, as we have seen before, is almost all pure water, and the hydrometer does not float, the acid being all in the plates in the form of lead sulphate. As you pass an electric current through the battery, the oxygen and hydrogen atoms, which are combined in water and form water, are made to separate by the electric current passing through the water. The hydrogen atoms go to the negative plate and combines with the lead sulphate and forms sulphuric acid, leaving just the spongy lead on the negative plate. The oxygen goes to the positive plate and combines with the lead sulphate and forms sulphuric acid and leaves peroxide of lead on the plate. You can readily see that the acid really comes out of the plates by the hydrogen and oxygen atoms combining with the substances on the plates and forming acids.

This action continues until all the substance on the plates has been changed over to acid, the solution by that time being almost all acid, and a hydrometer reading will show that the density of the acid is 1270. When fully discharged, the hydrometer will read 1000 or, in other words, will not float. But the battery should not be discharged so that the solution is below 1100 or 1150 specific gravity.

If the battery is giving trouble, take an acid reading of each cell, and if you find each one to read 1250 you know that the battery is fully charged, but if one cell reads 1000, or the hydrometer does not float, you then know there is a short circuit in that cell. A short circuit in a cell is either caused by the warping of the plate, or a piece of active material has bridged the positive and negative plates some place, either on the top or ends of the cell. The cell should then be opened and repaired.

HOW TO OPEN A CELL:

Most of the batteries now in use have large lead connectors, which connect the three cells of a six-volt battery in series. With

a center punch, mark the centers of the four connections. With a ¾-inch drill, drill down until you get to the post where it connects with the connectors. Now drill the other end of your connector the same way. With a pair of pliers work the connection back and forth until it can be taken off. Do the same thing to the other connection on the opposite side. You can now dig out the sealing compound with a heated screw-driver.

After you have removed all the sealing compound apply a flame, either from the city gas or a blow-torch, and gently heat the cell cover and top of cell. When throwing a flame on any battery, you must be very careful that there is no gas coming out of the cells for a battery which has just been charged gives off gas. The safest way is to pour out all the solution into a glass or stone jar and then there will be no gas to explode. The heat from the flame will soften the cell cover and top of the cell. While warm, take a pair of pliers in each hand and pull gently by each post. Do not pull too hard, if the group of plates does not easily start, fill the cell with boiling water, which will soften the whole cell, and you can then pull out the plates without any trouble. If you would pull too hard on the group of plates, you would ruin them by pulling off the strap to which all the plates are connected.

HOW TO CLEAN AND EXAMINE PLATES:

Now lay your group of plates, which you just pulled out, on a clean bench, and examine carefully. If the wood separators are soft and mushy and perhaps worn thin at several place, it would be advisable to change them. If you should happen to find the separators in good condition, examine the group carefully and you might find that a piece of active material or other conductor lies between a positive and a negative plate, thereby causing a short circuit.

HOW TO REMOVE A DAMAGED PLATE:

Suppose you find that one or several of the positive plates are buckled or worn out. The best thing to do is to cut out the plate at the place where it is lead burned to the strap and a new one should be leadburned in its place.

You will very seldom have to replace a negative plate, for they generally outlast two positive plates. The negative plate will sometimes have to be replaced when the active material or paste has fallen out.

HOW TO PUT IN NEW SEPARATORS:

Cut your separators so that they extend about ½-inch over the plates. It is better to have them extend over the plates, as there is less danger of the scales from the lead plates (or any other material) bridging across from negative to positive plates, thereby causing a short citcuit. Clean your plates by pouring some water over them, making sure that there are no scales on the edges of the plates.

Then put the positive group of plates into the negative groups and start putting in the separators with the smooth side

against the negative plate and the grooves in the separators running up and down. Try to get them in even on all sides, and be careful not to split the separators when pushing them in.

When you have all of the separators in their place, wash off the group and examine carefully and see that the plates are all separated. The cell must be thoroughly washed out and cleaned from mud and any other deposits in the bottom.

Then heat gently, with a gas flame, until cell is warm and the hard rubber softened. When it is soft it will not crack as easily as when cold and brittle. While the cell is warm, push in your group of plates carefully, paying particular attention that the negative post is on the same side as the positive post, to which it will afterwards be connected. Then put on your cell cover. If it fits too tightly, heat it a little.

HOW TO SEAL THE BATTERY:

You are now ready to seal up your battery. Heat the sealing compound in a small bucket, and apply a little with a putty knife around the places where the cell cover touches the cell. Let this harden then put in a small amount at a time, but always wait until it has become hard before you add any more. If you add the sealing compound too fast, it would run down through the cracks into the battery. When filled throw the flame on the sealing compound and smooth out the rough places.

MAKING EXTERNAL CONNECTIONS:

You are now ready to put on your outside connectors. Clean the terminal posts and connectors where the connections are to be made with a file or knife, and then put the connections on the battery. With a red-hot soldering-iron you start to melt the post; when the lead is in a molten condition, add some more lead until you build up the post to the top of the connectors. While you are building up the post, always try to get the lead on the inside of the connector to melt, so that when the post cools down, the post and the terminal will be like a solid piece of lead. The quickest and best method would be to use a lead burning or a welding outfit if you have one handy.

CHANGING A REPAIRED BATTERY:

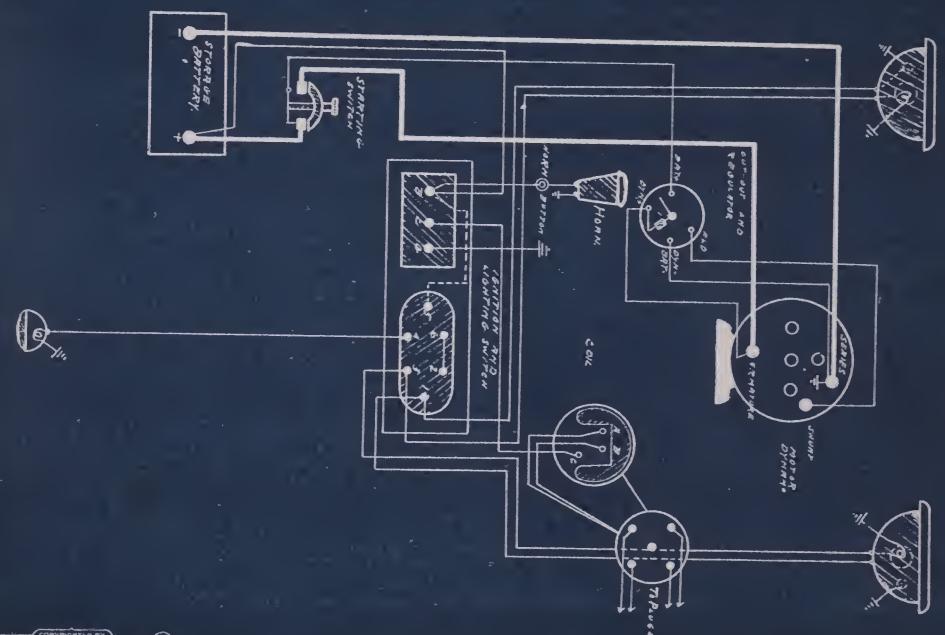
Your battery is now ready for the acid. If it was repaired for a short circuit, put 1250 degree acid into the cells that were repaired. The reason you put such a high acid in the cell is because the acid soaks into the new separators. It is hard to tell just what gravity of acid to put into the cell. The best is to put in 1250 and start charging. The acid in a short time will drop down to about 1100, and as the charge goes on it will drop down to about 1100, and as the charges goes on it will gradulaly rise until it becomes constant, that is, the acid reading will be, say, 1200 and at the end of another five hours, charging it will still be 1200. This shows that the cell is fully charged, but the acid gravity is not high enough. Add a stronger acid solution until the gravity shows 1260. If you only repaired one cell of a 6-volt battery, the other two cells should

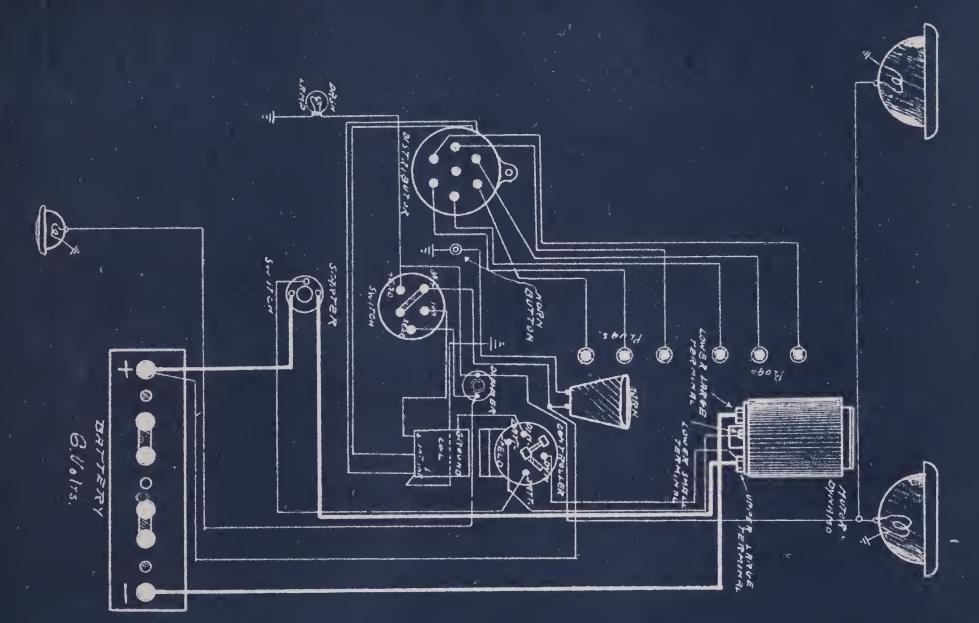
have been discharged with a lamp or two, during the time you were repairing the other cell. If you do not discharge these two cells, when you later charge the whole battery these two cells would get too much of a charge. You are now ready to put the battery on the car. Clean your connections carefully, especially the positive one, and put on a little vaseline to protect the connections from the action of the acid. Fasten all connections securely.

MEMORANDUM

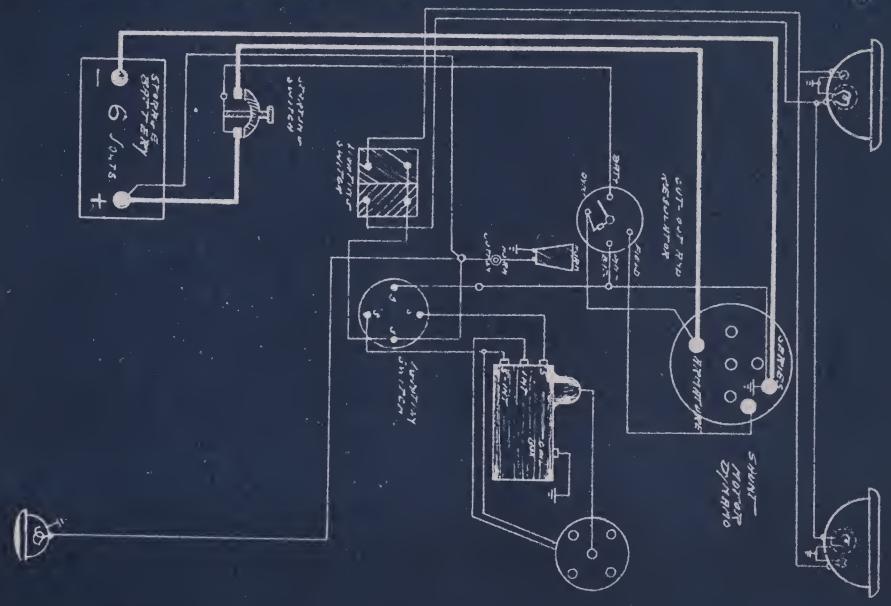
MEMORANDUM

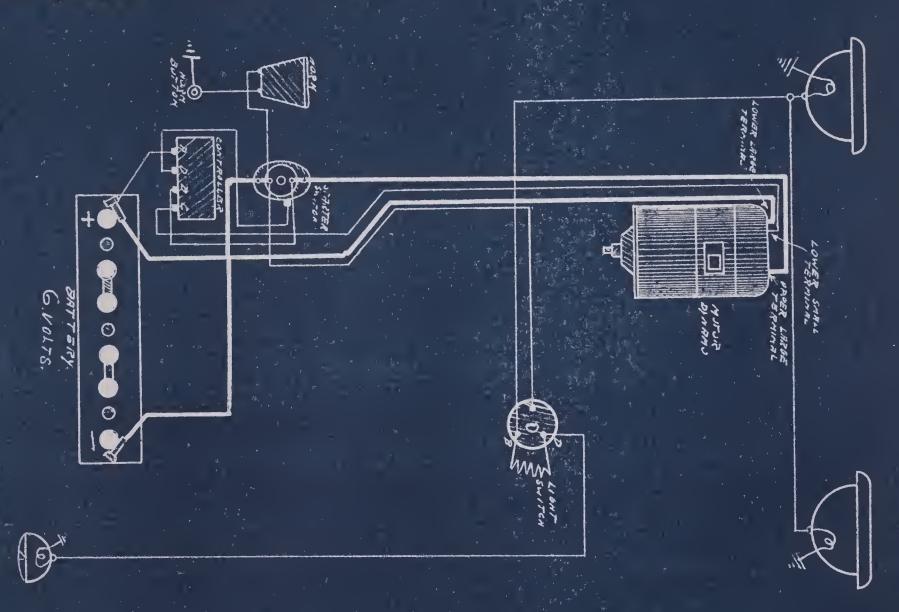
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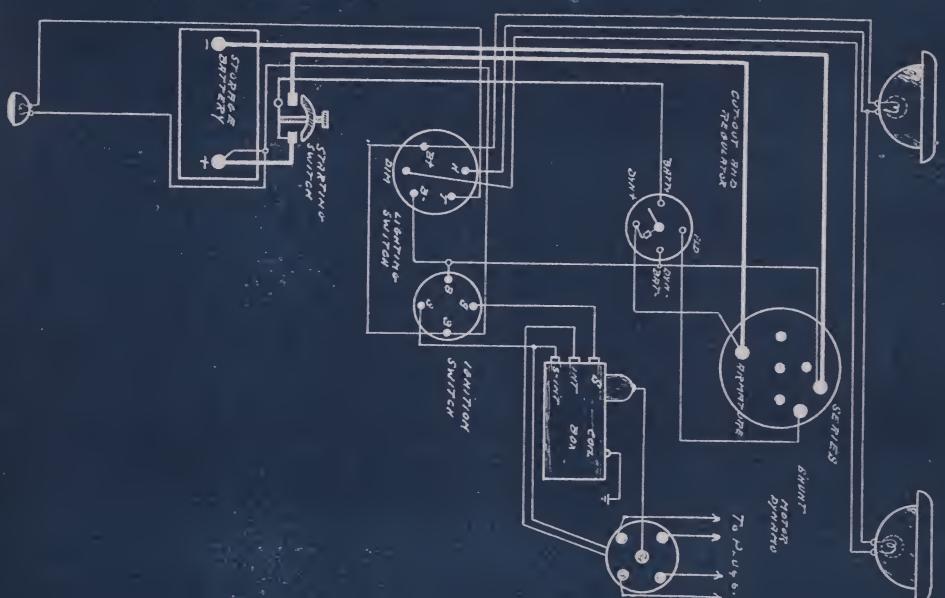


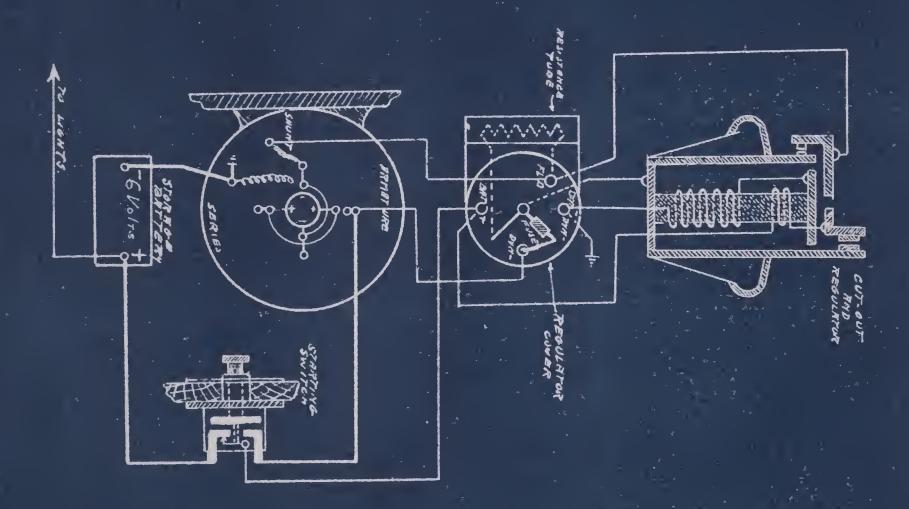


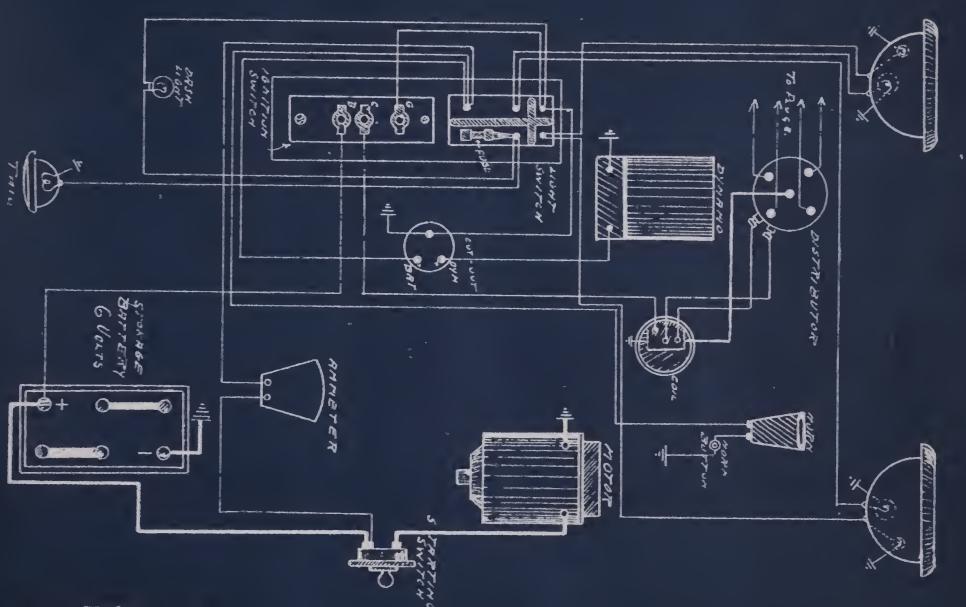
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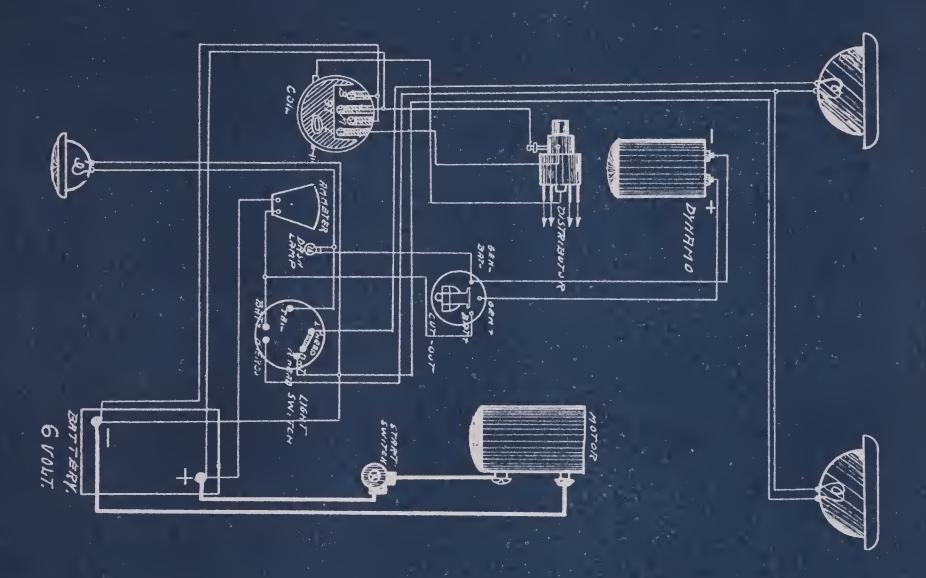


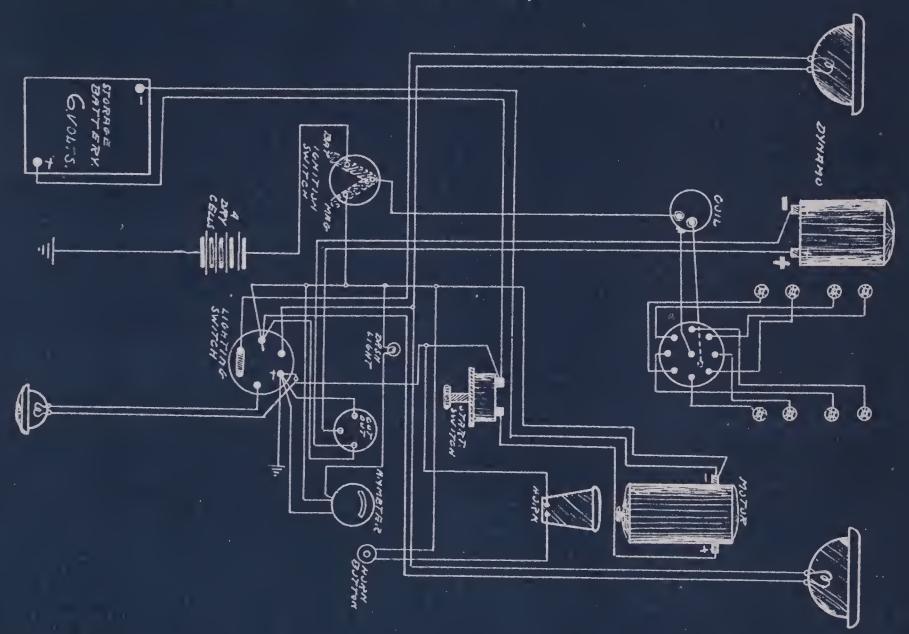


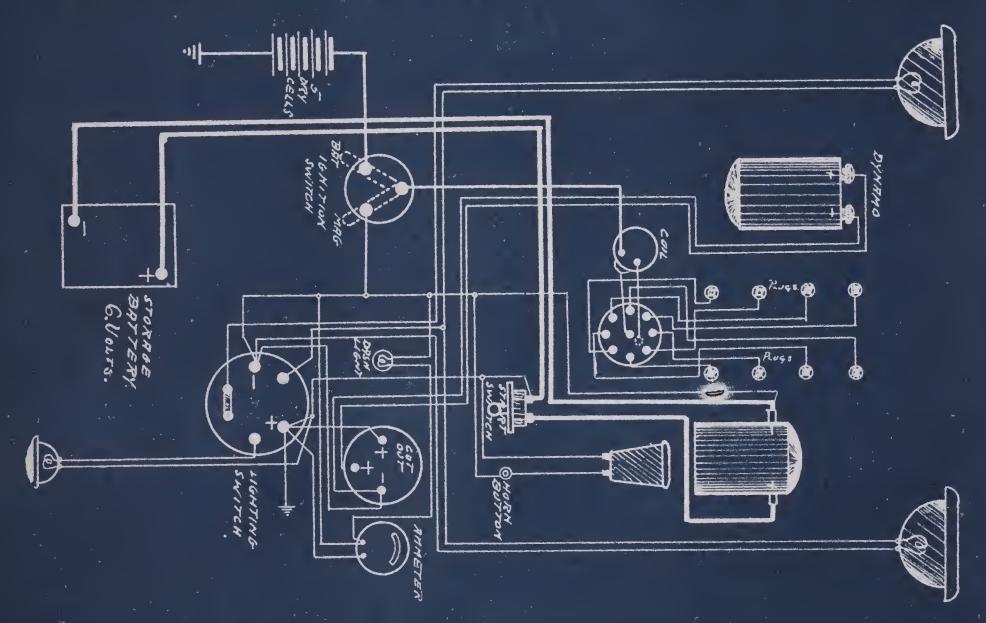




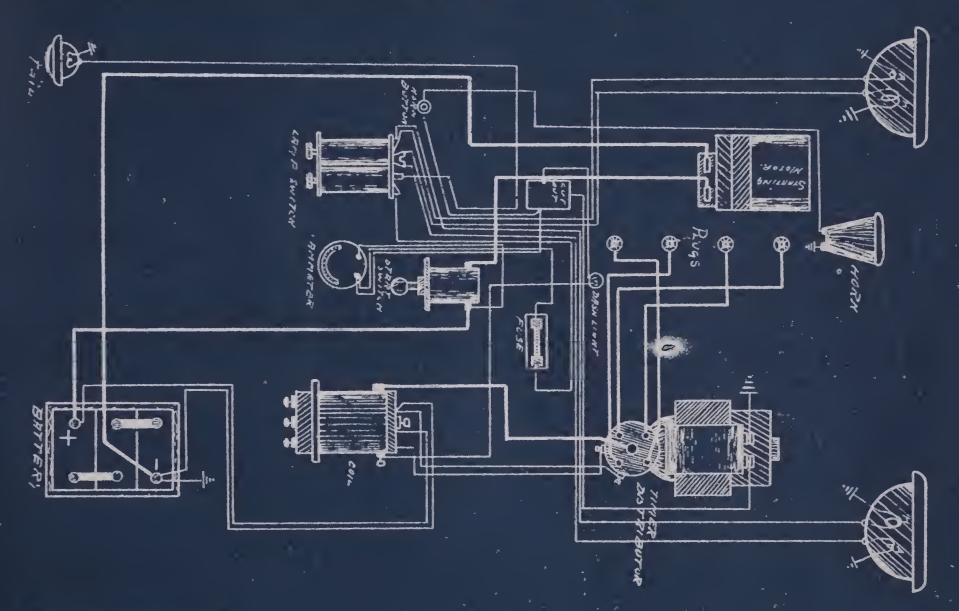
AUTOLITE ALLEN 1914



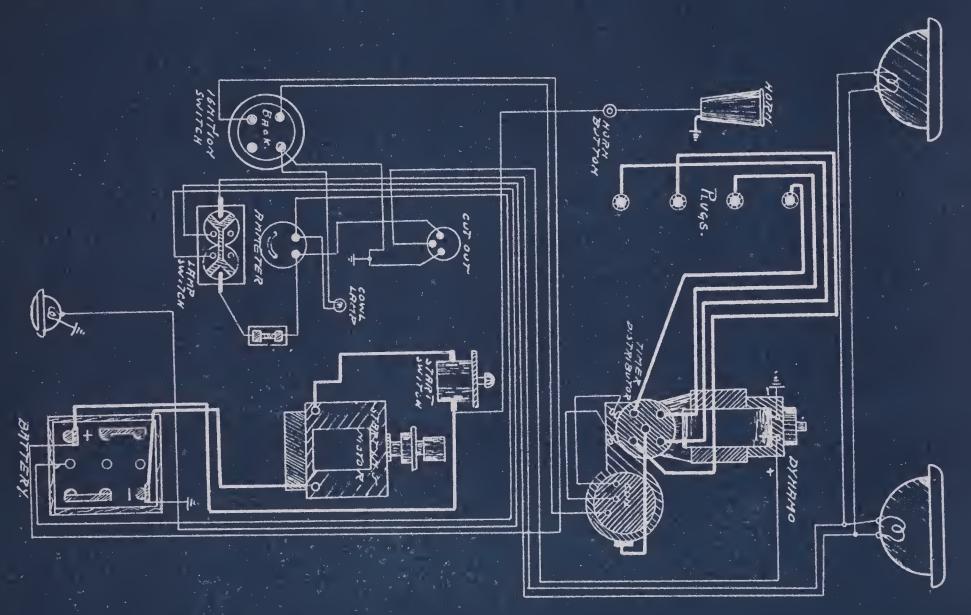




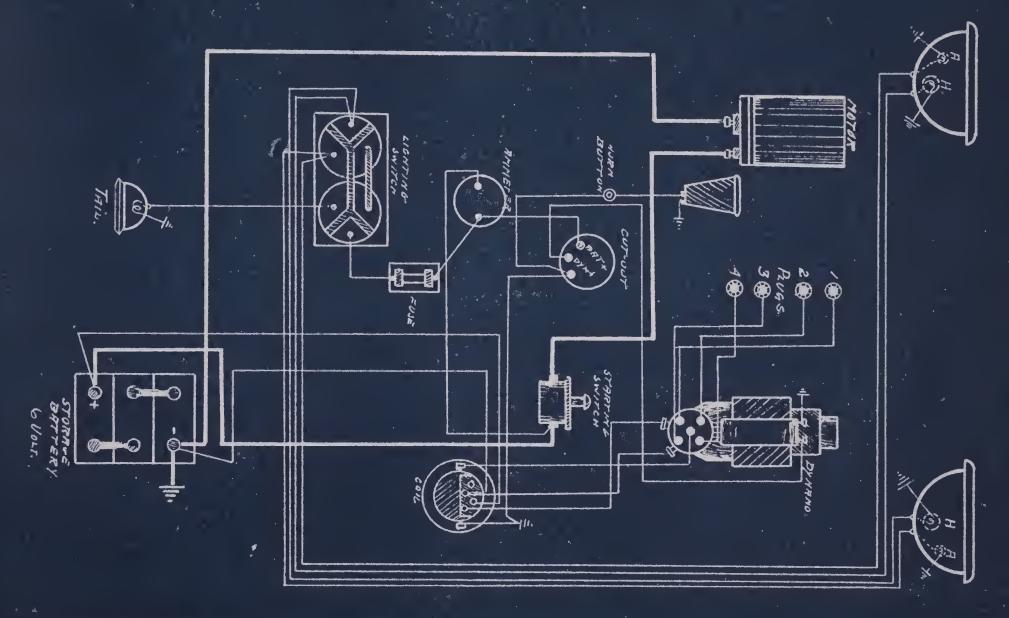
AUTOLITE CHEVPOLET 1915 FIRST MODELS.

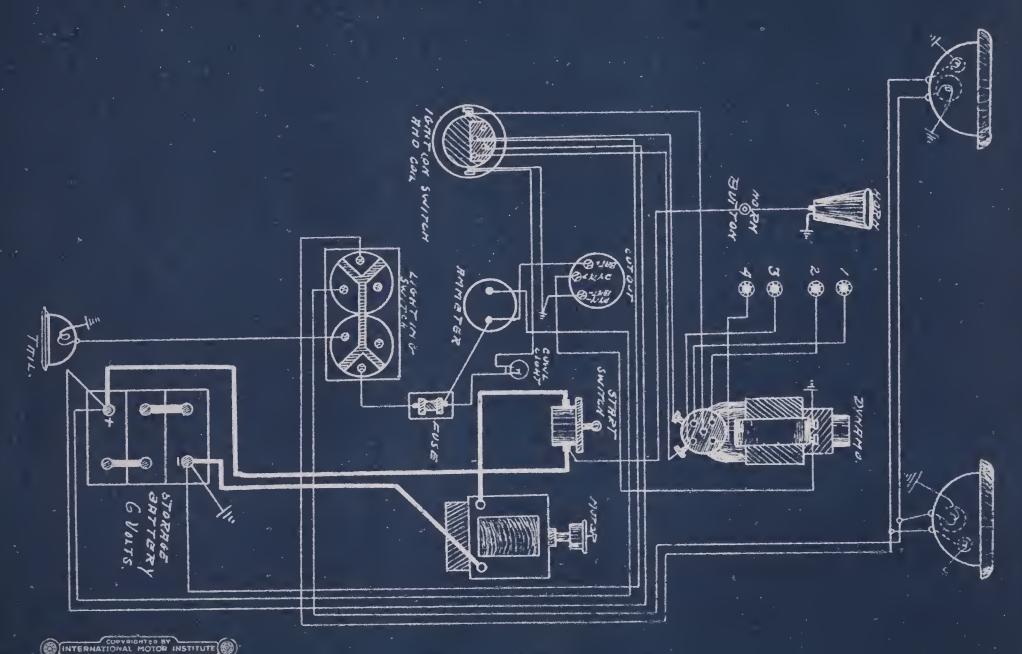




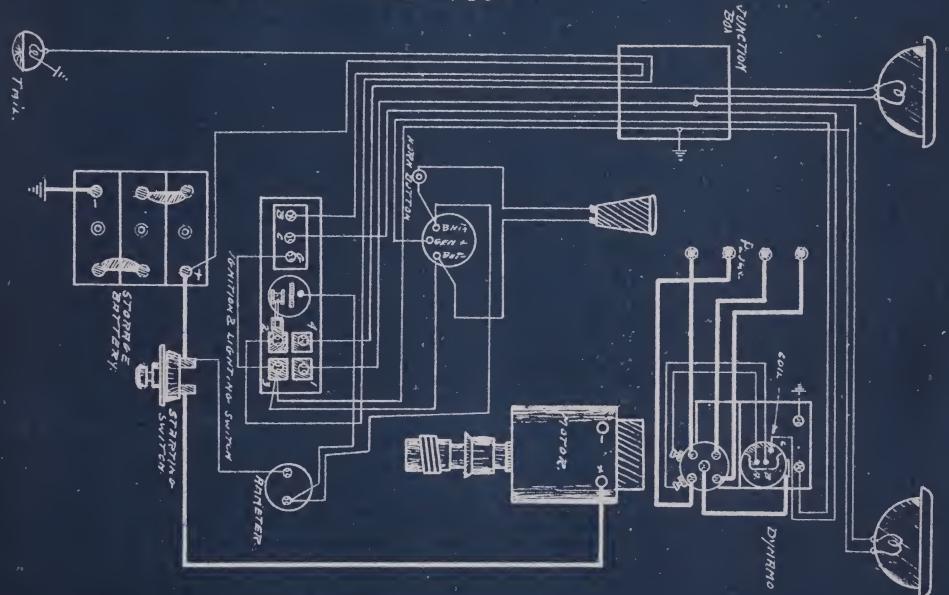


HUTOLITE CHEVROLET 1915 "HE"HEE"HA" WITH ARMORED CABLE

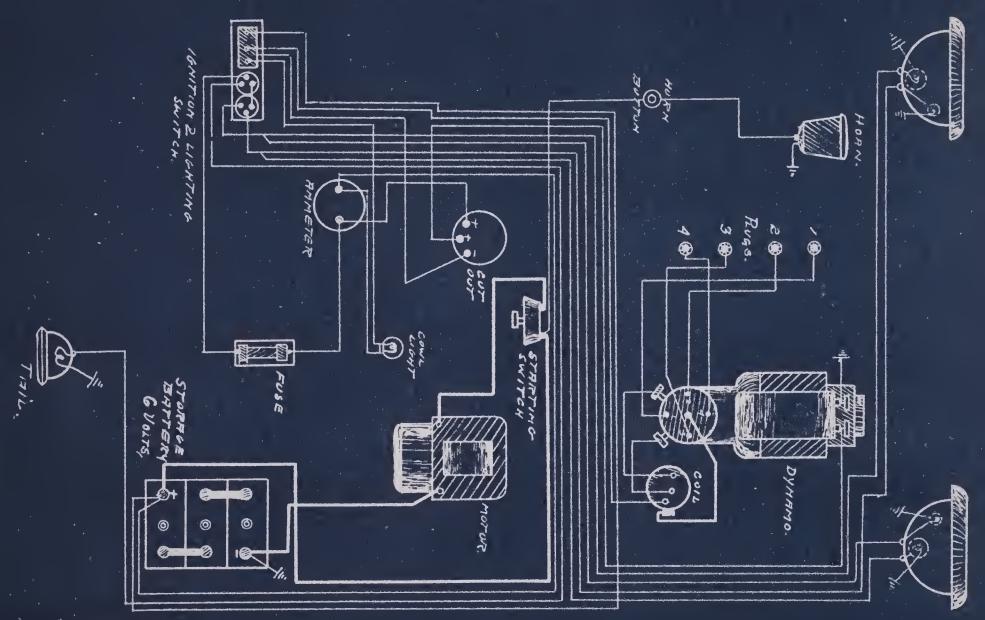




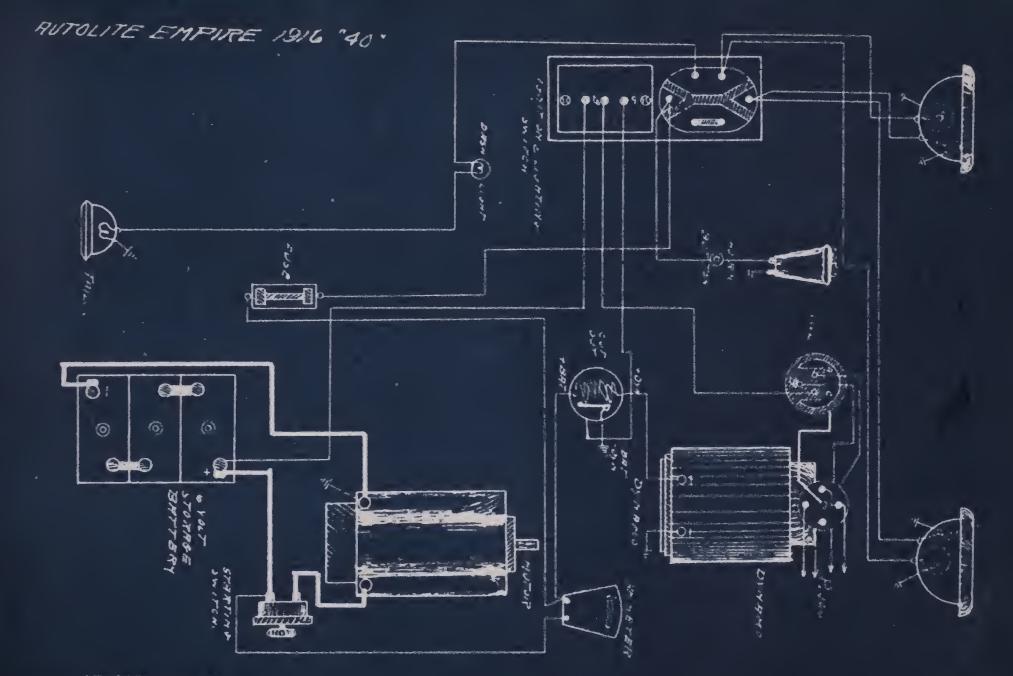
AUTOLITE CHEVROLET. 1916 "4-90"



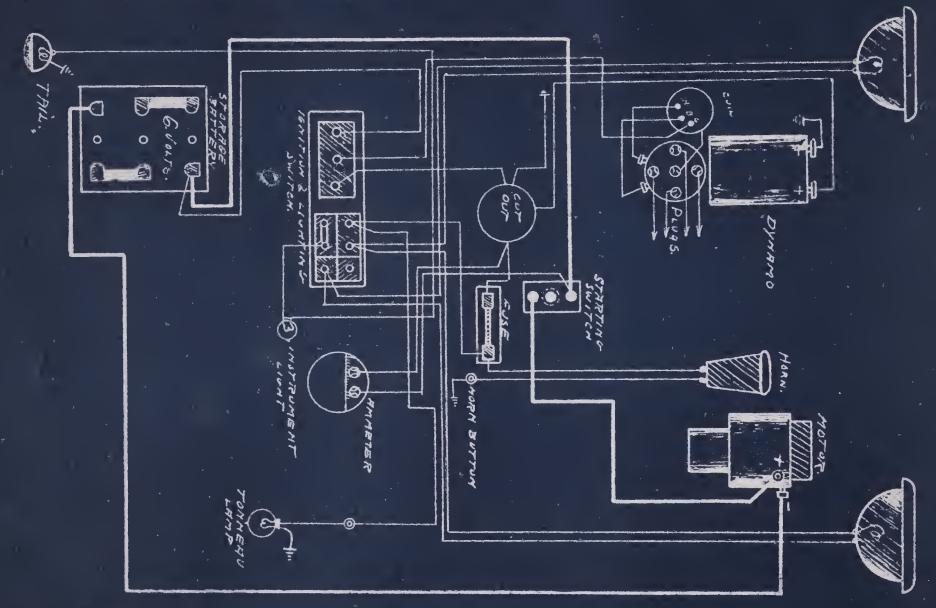
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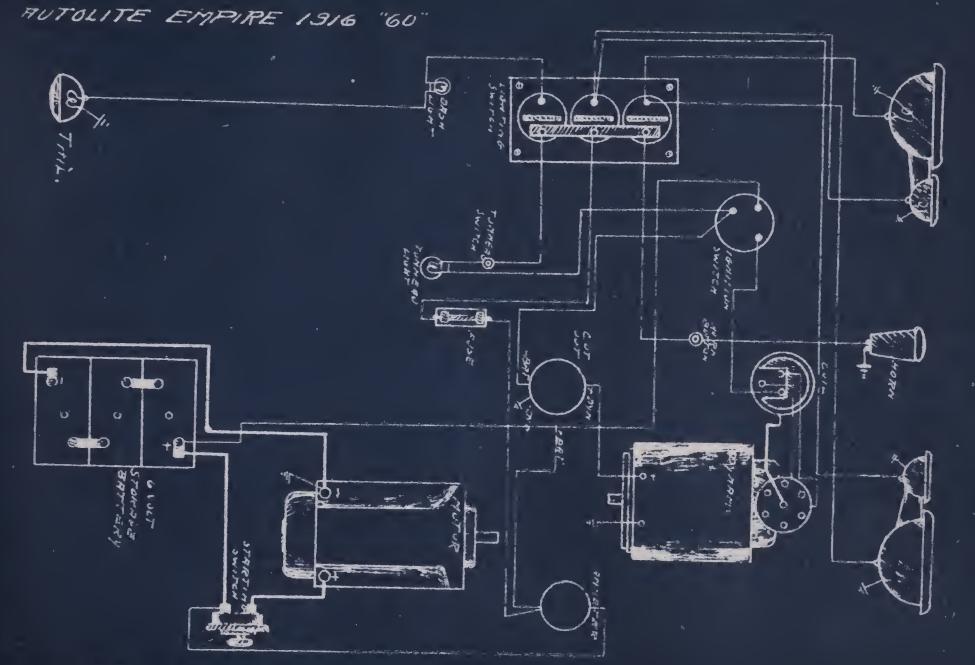


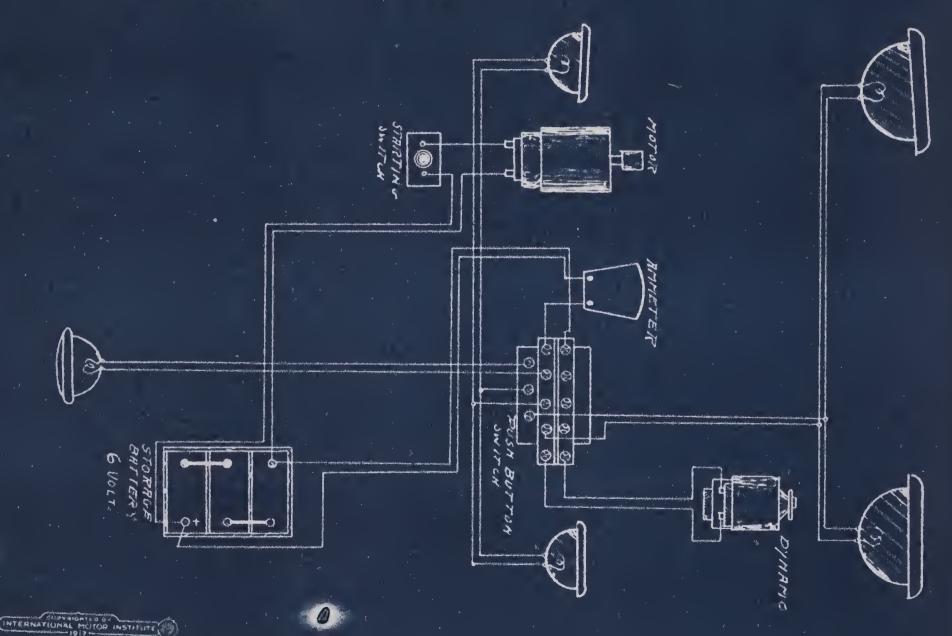
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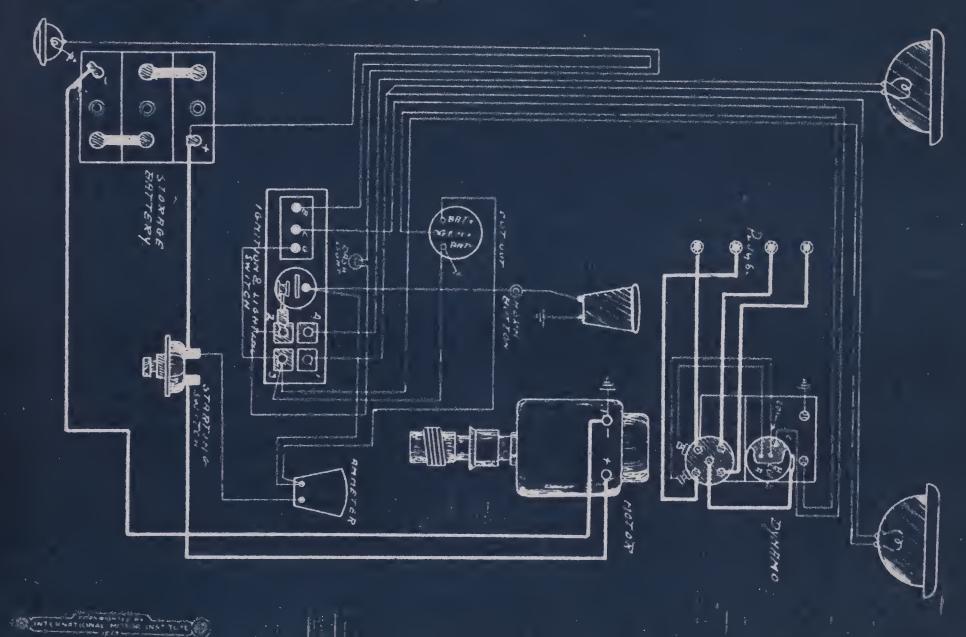
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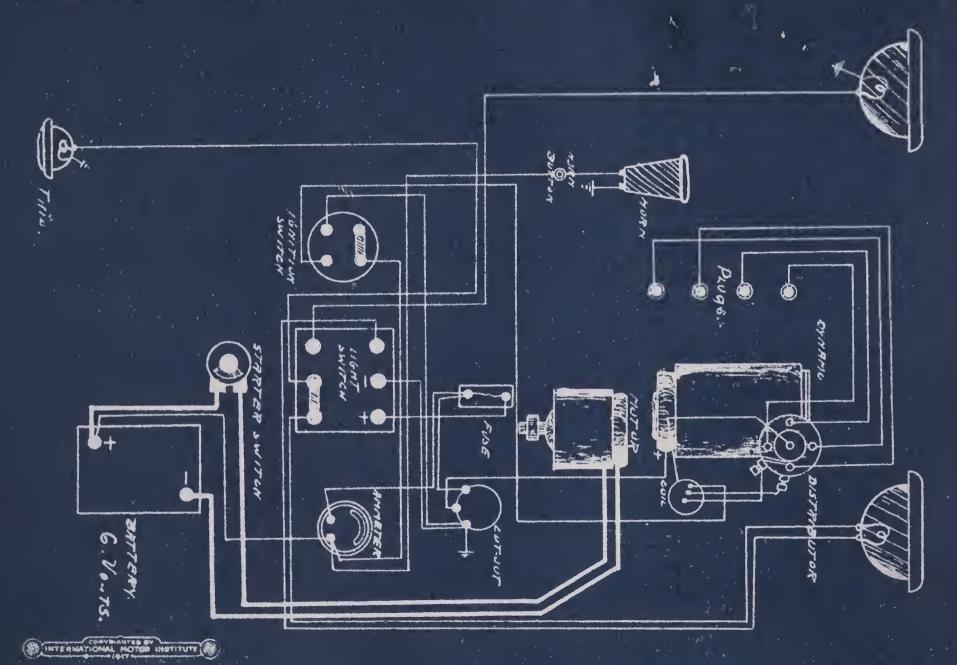


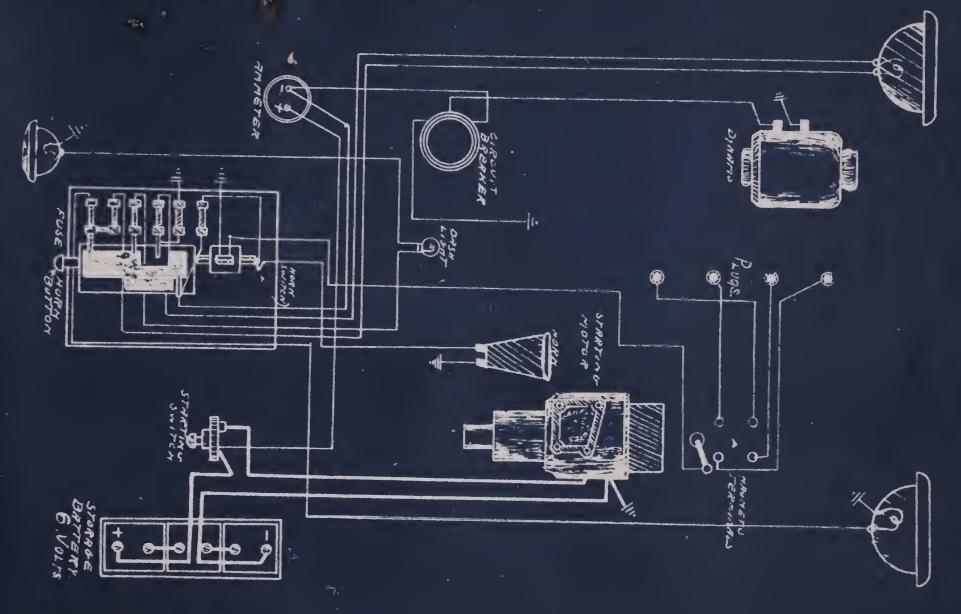




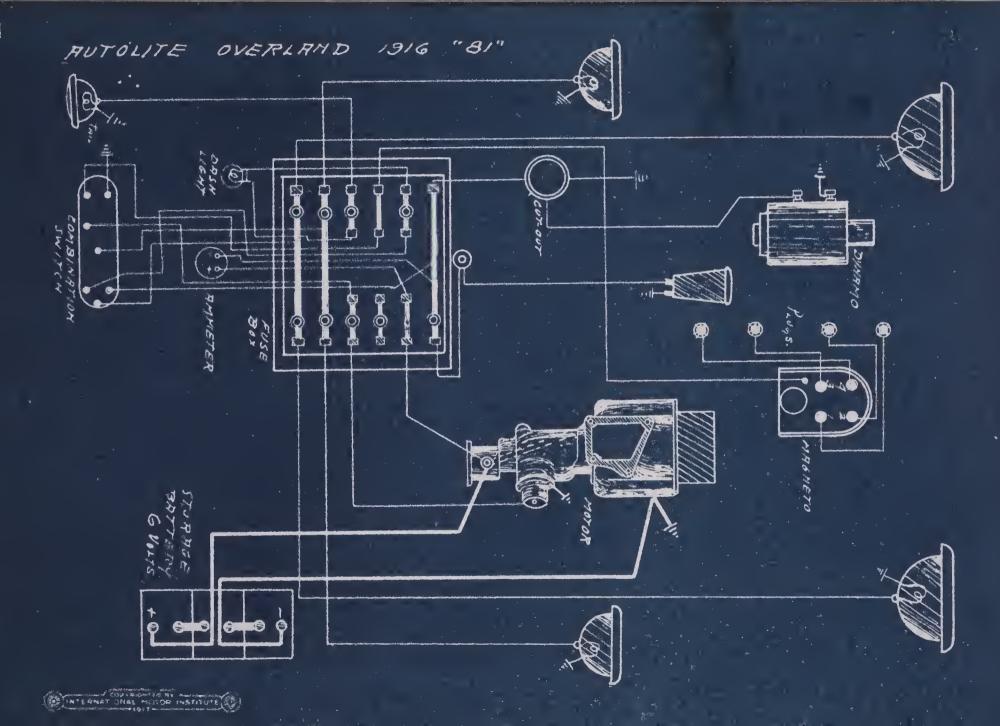
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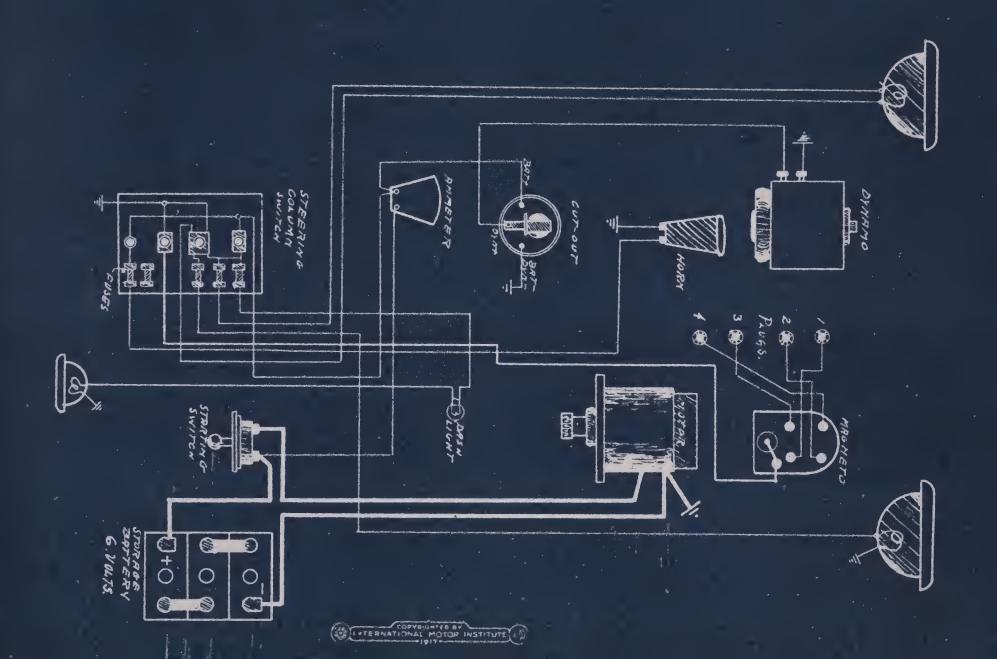


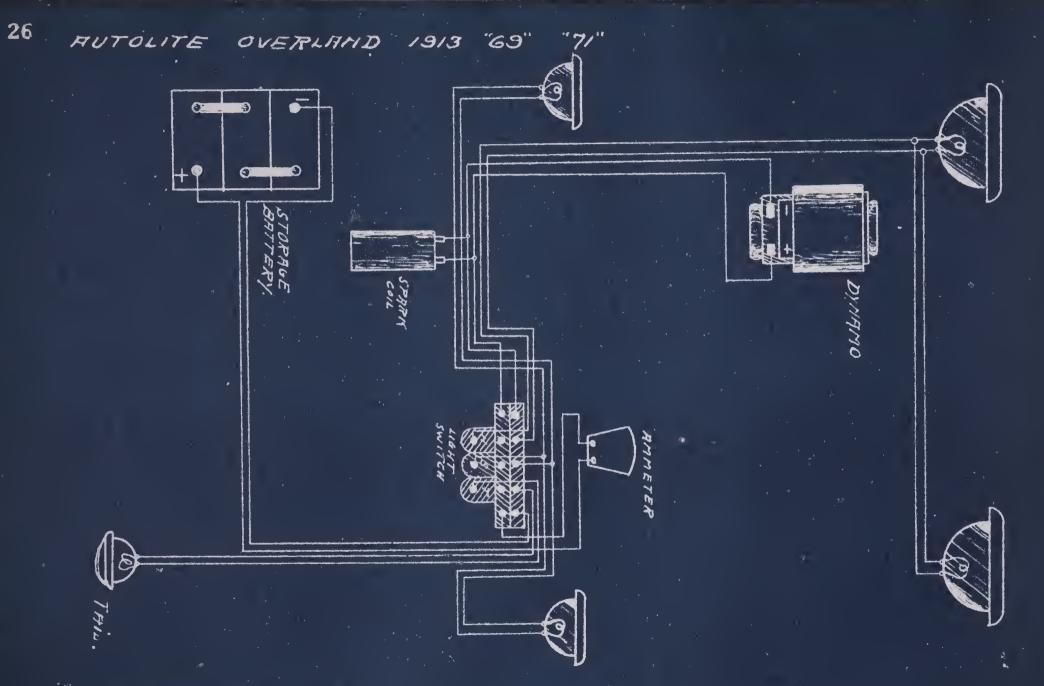




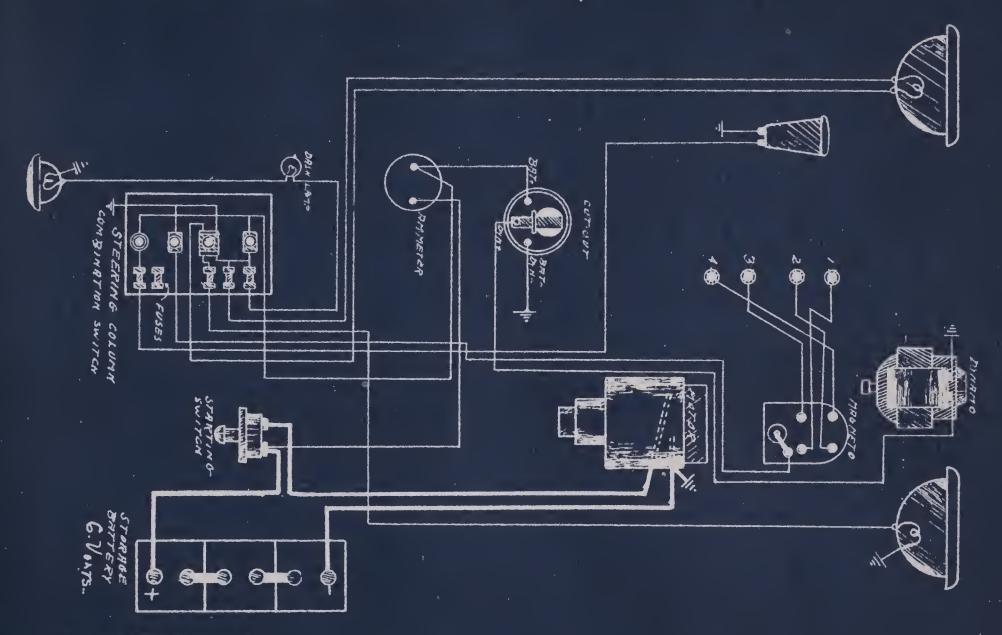


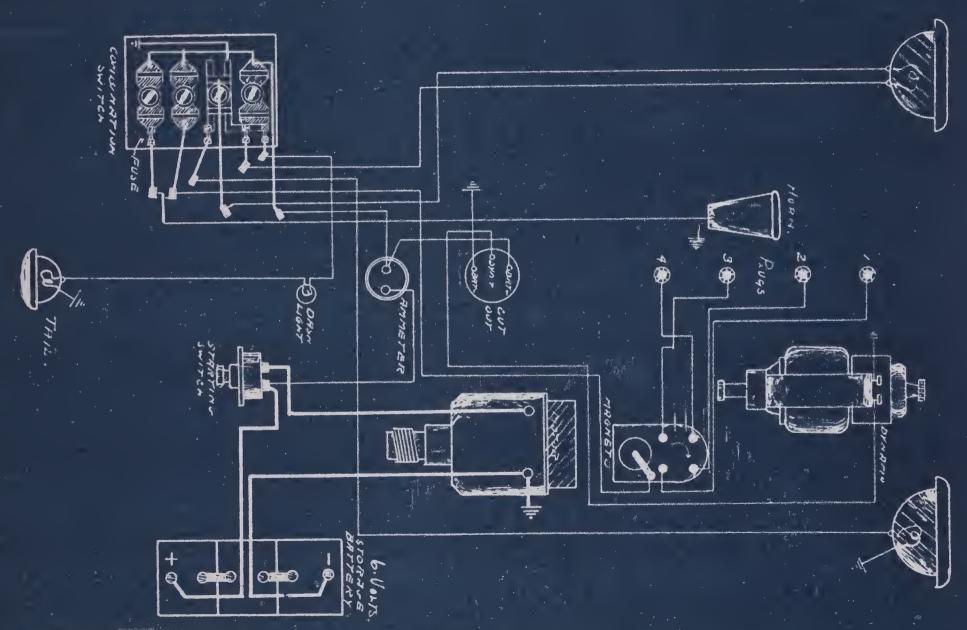








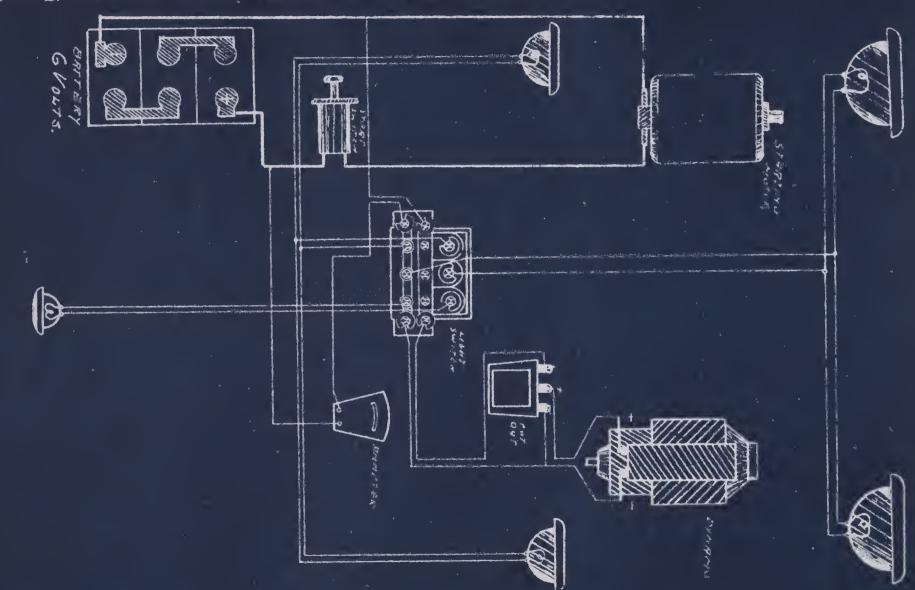




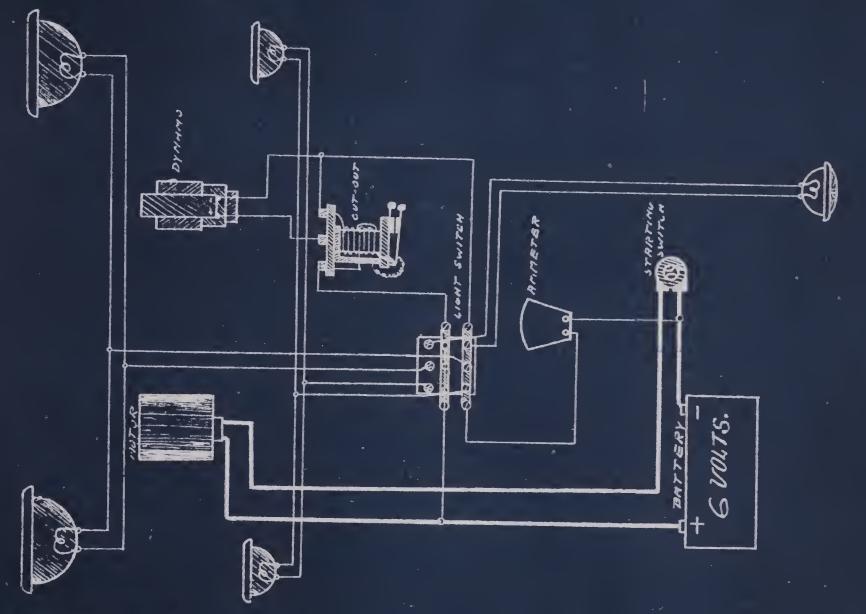
AUTOLITE STANDARD WIRING 1914 CONNECTICUT IGNITION.

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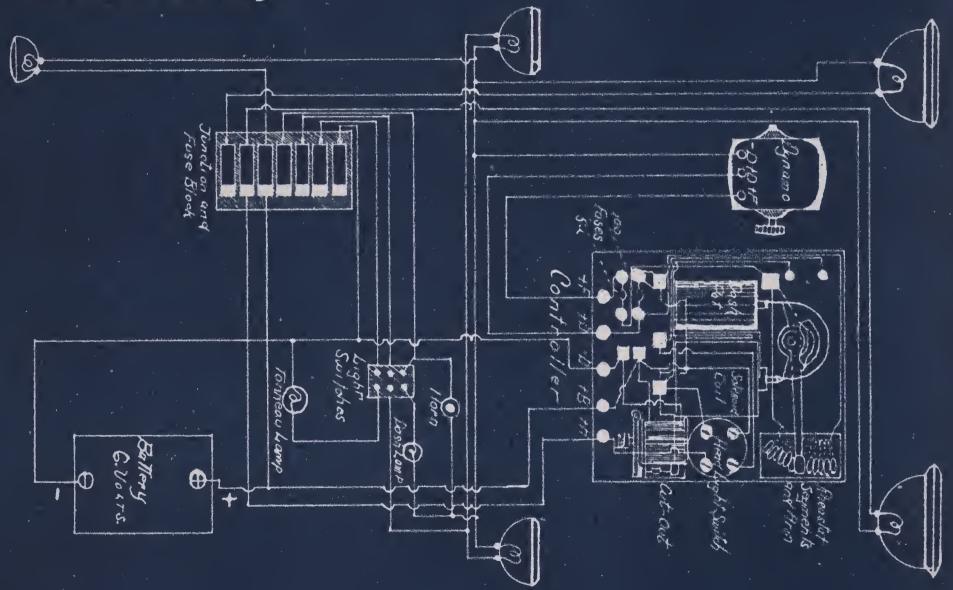
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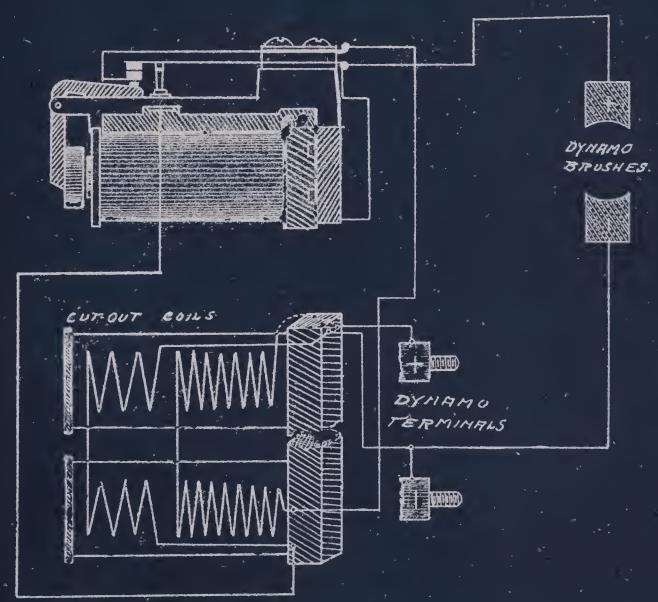


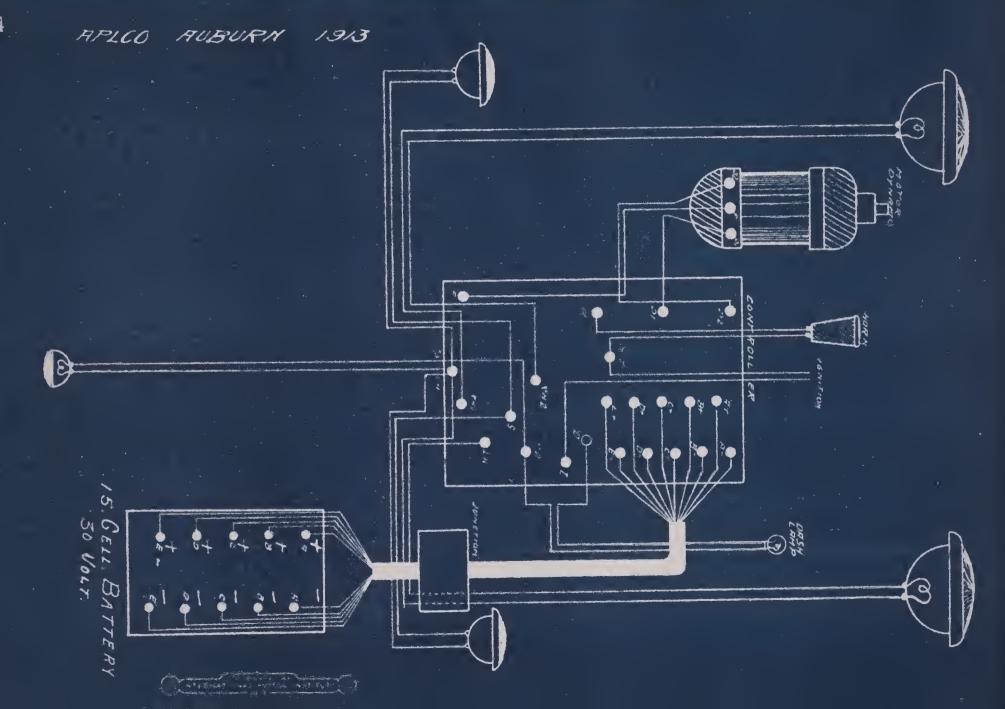
AUTOLITE STANDARD WIRING "G" DYNAMIO.

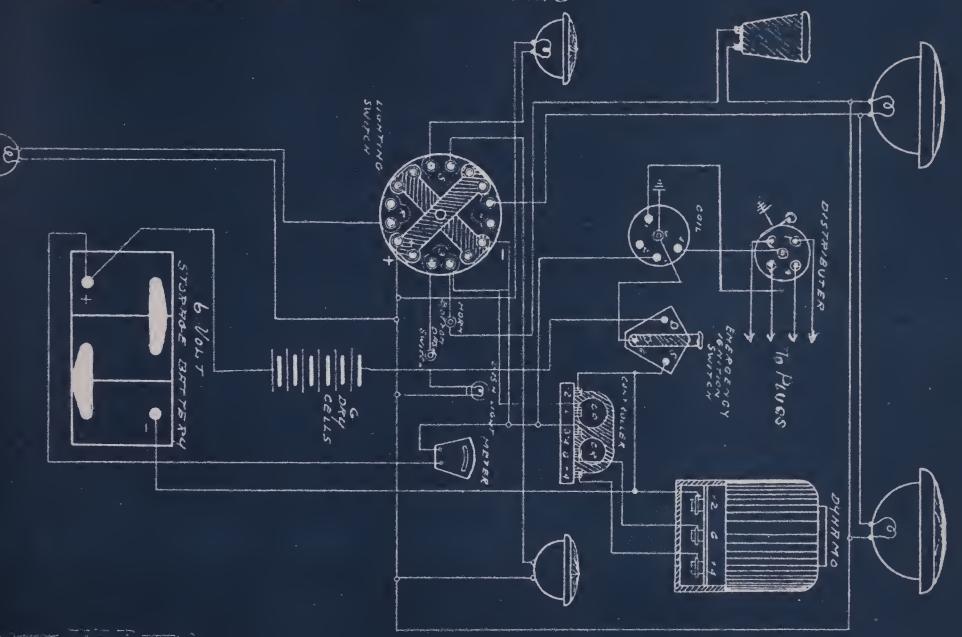


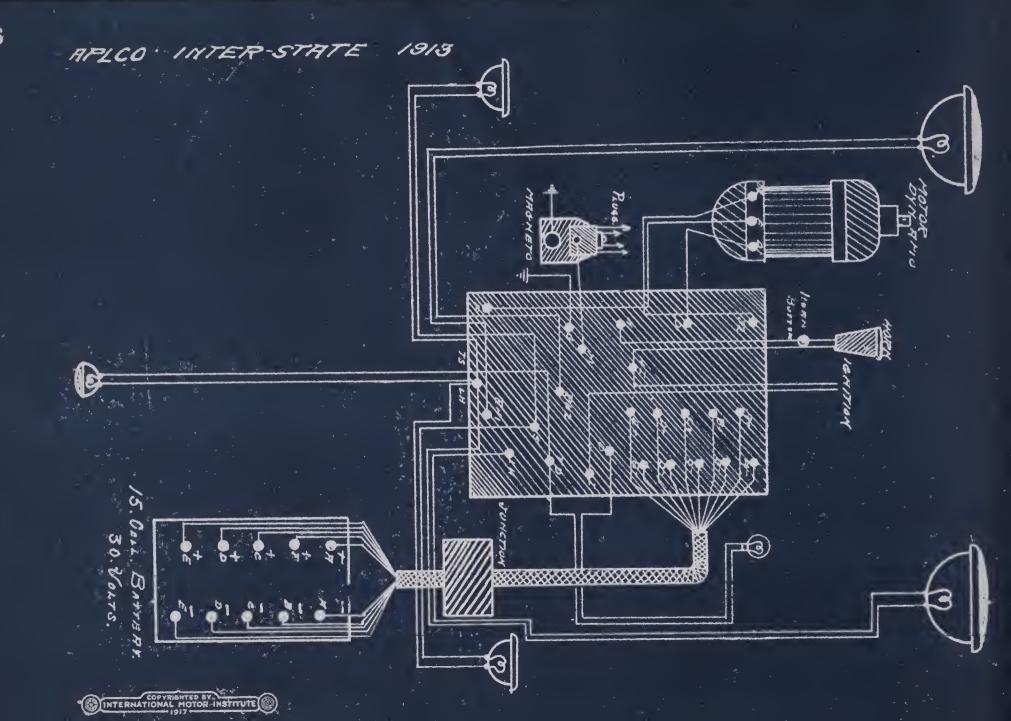
ADLAKE Standard Wiring

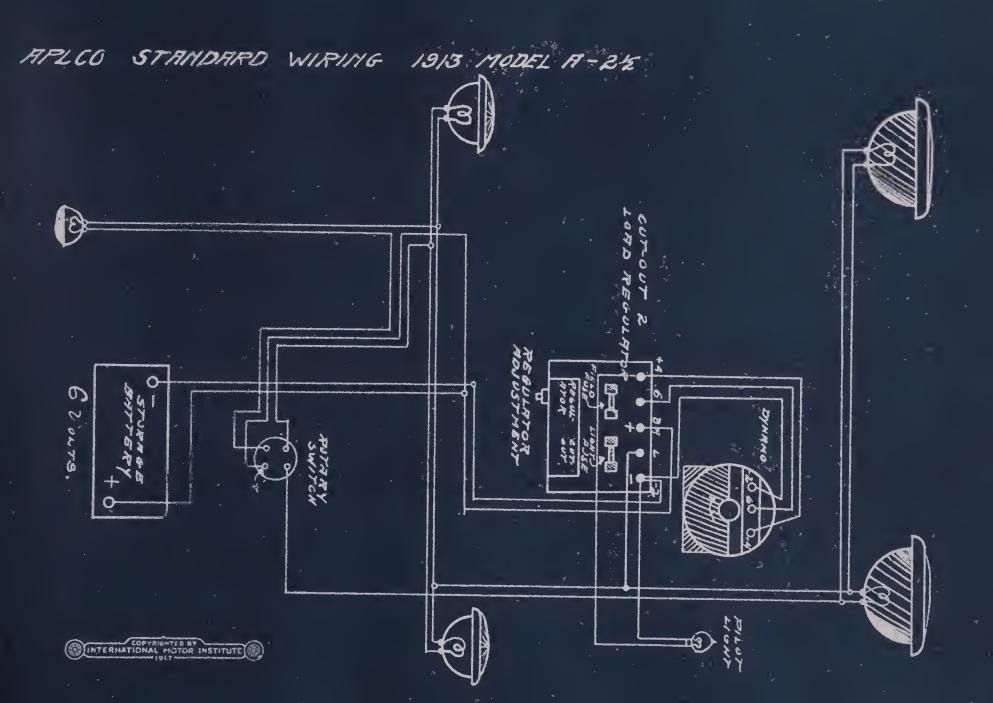


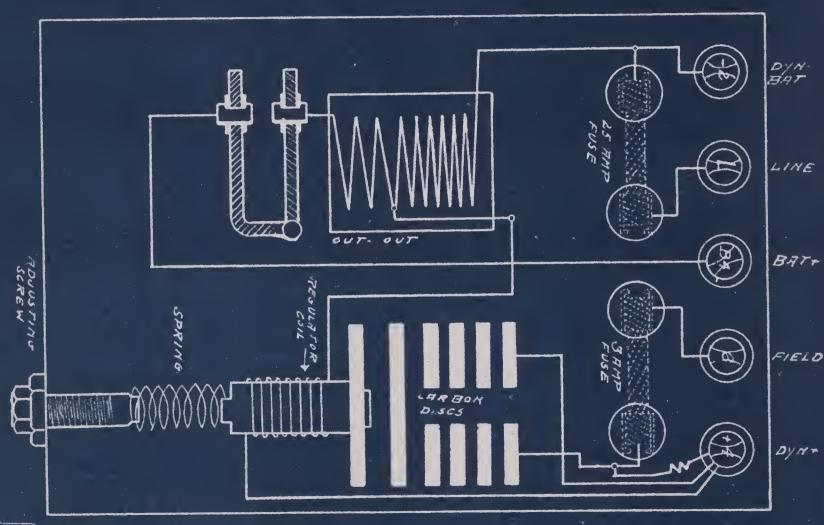




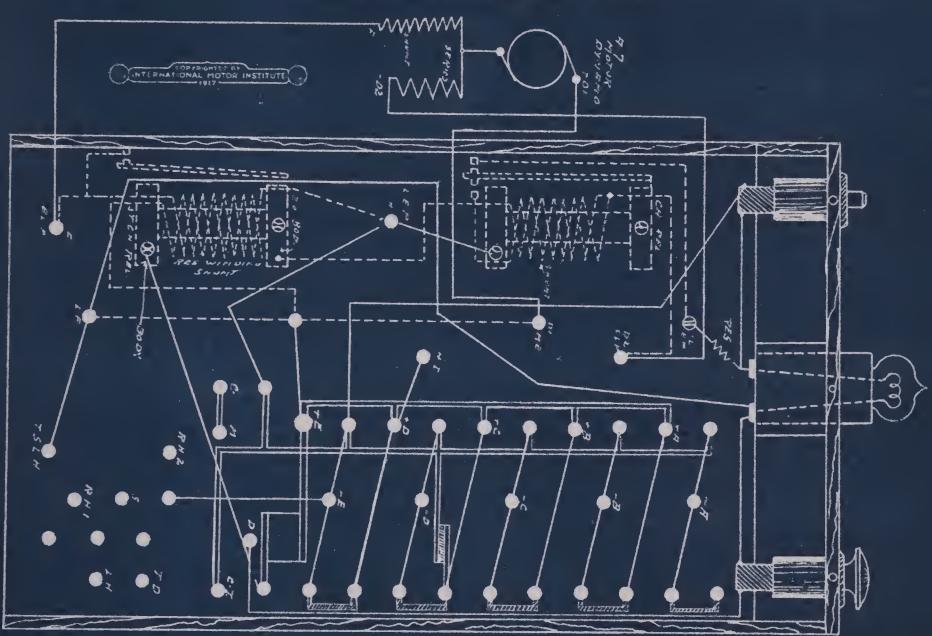




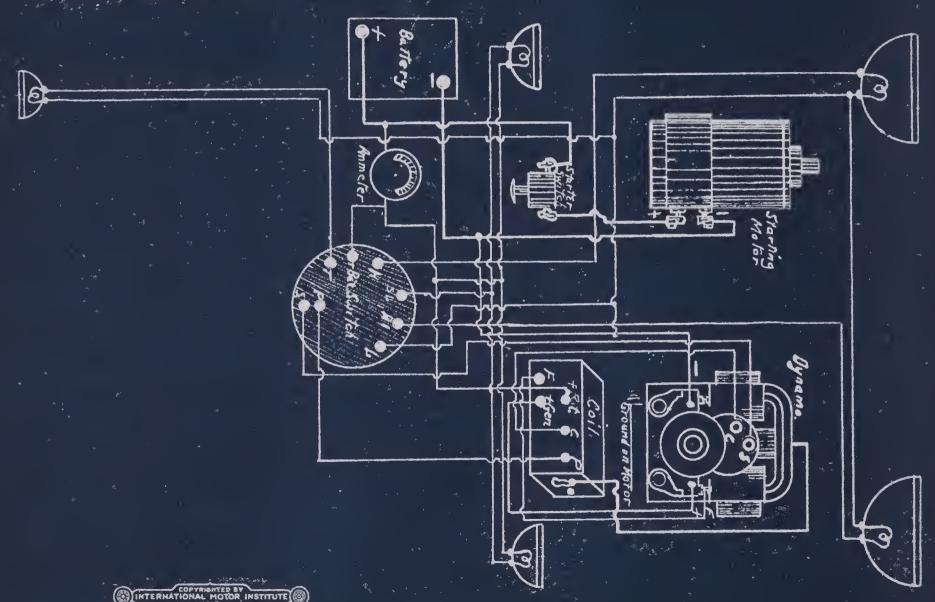




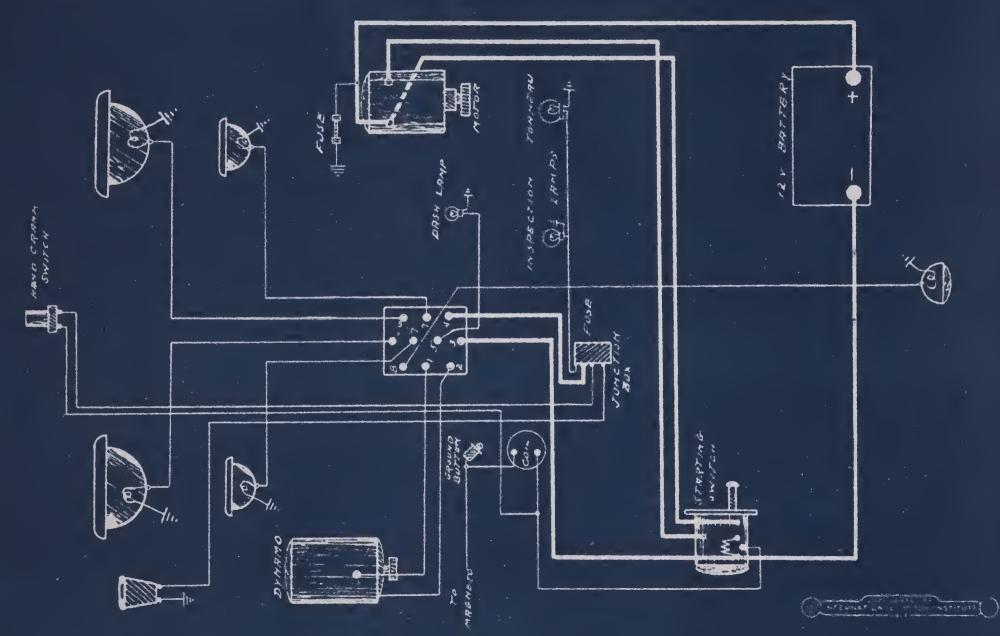
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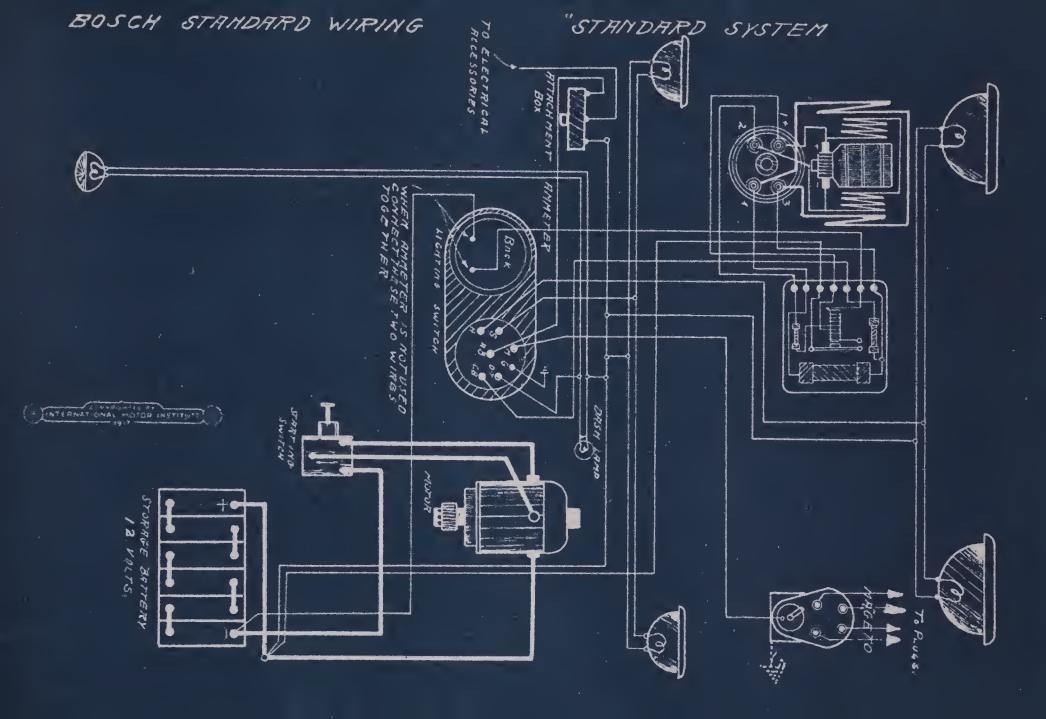


BRIGGS Lambert 1915

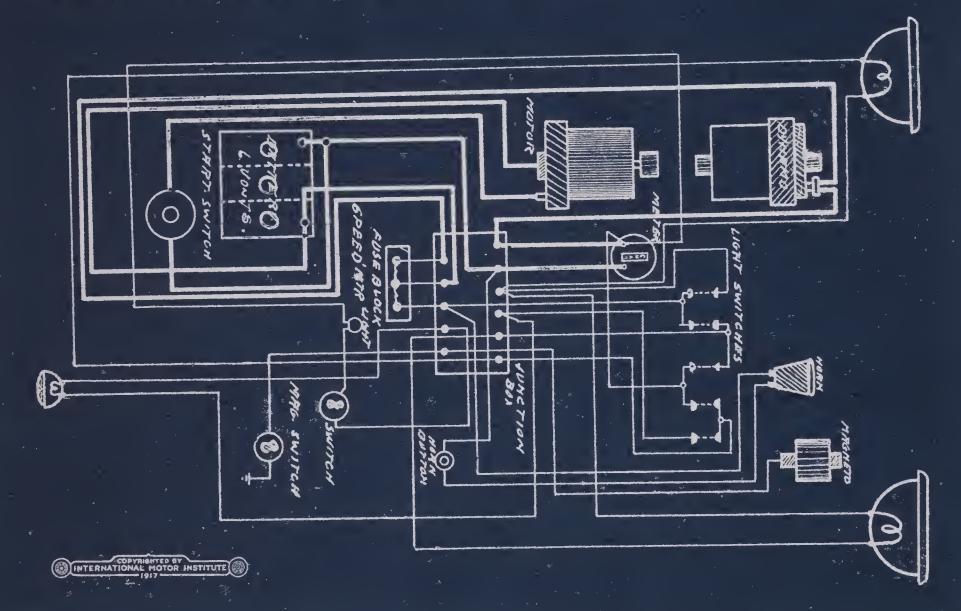


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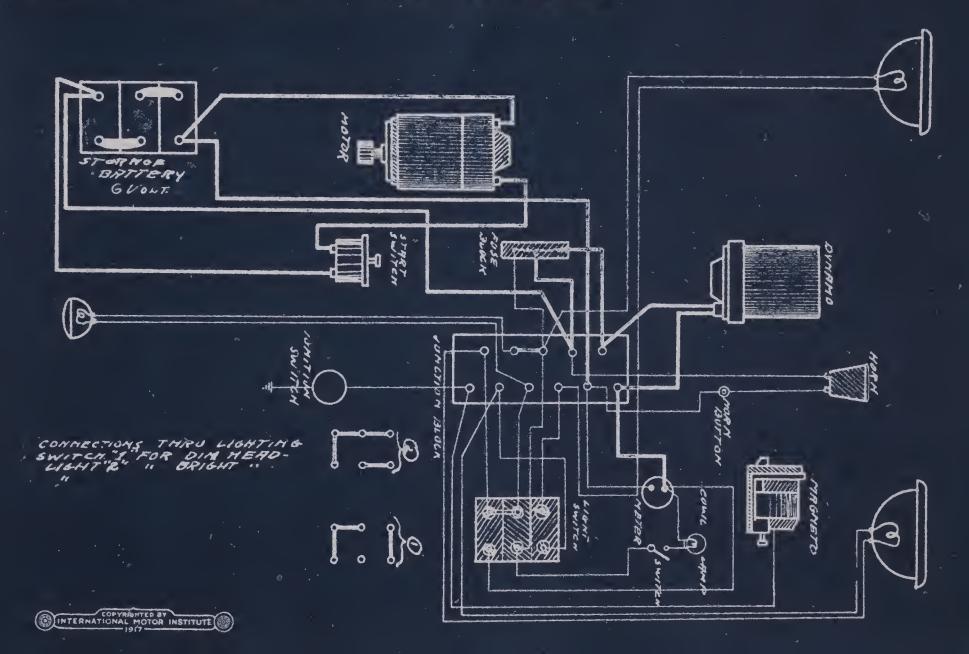




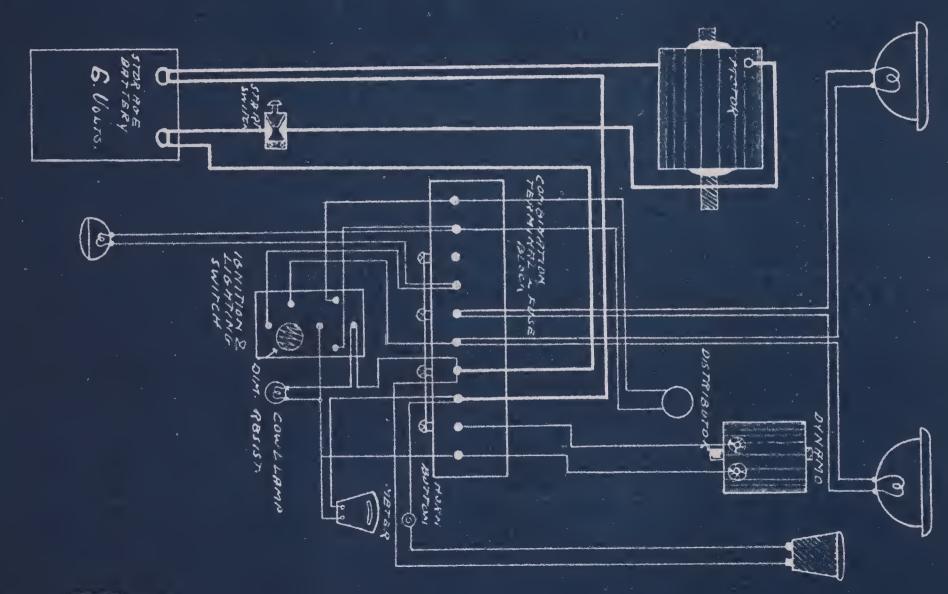
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BIJUR APPERSON 1915 "4" AND"6"

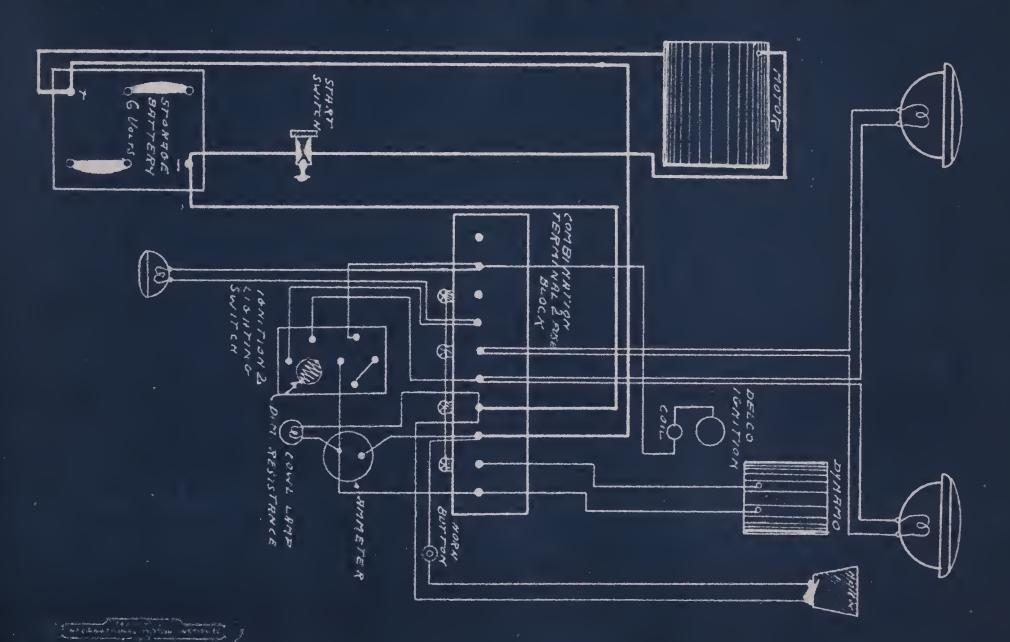


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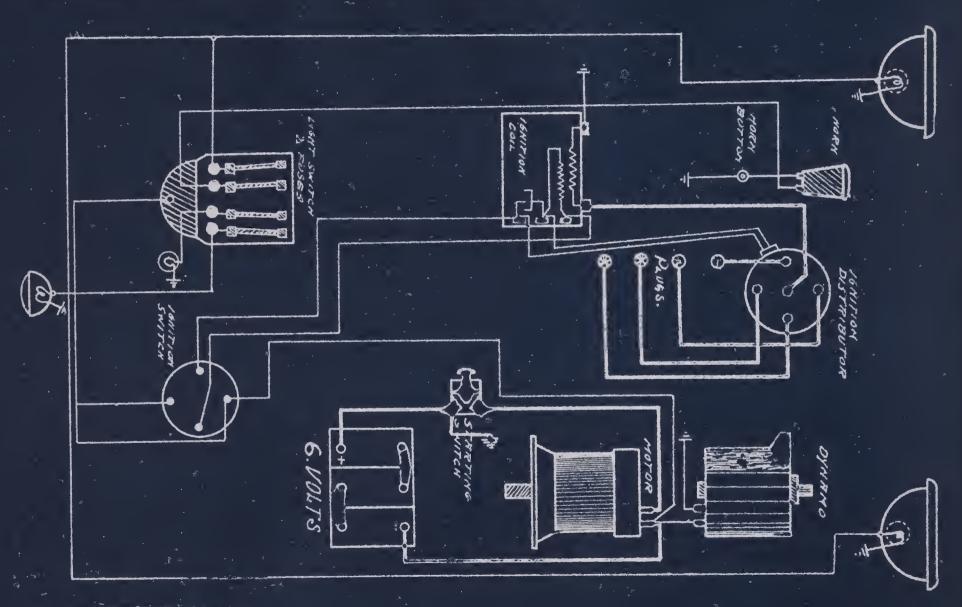


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BIJUR APPERSON 1916 6-48" B-58" DELCO IGNITION



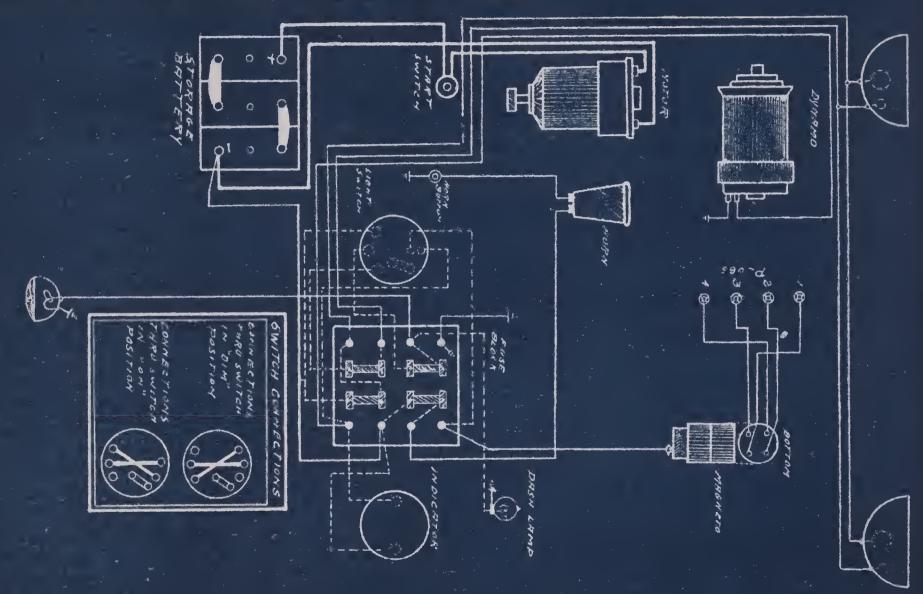
BIOUR HUPMOBILE 1916 MODEL"M"

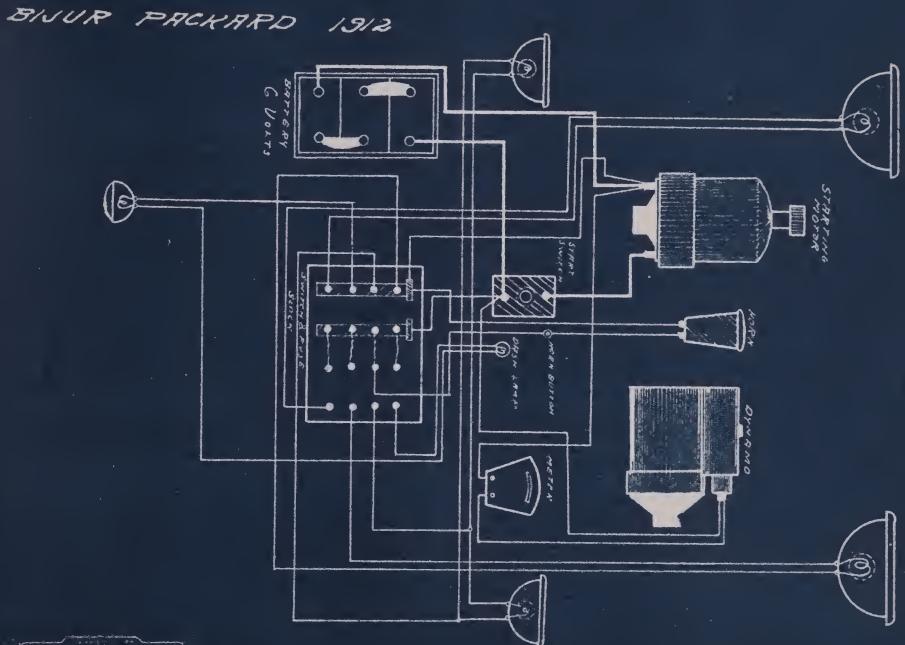


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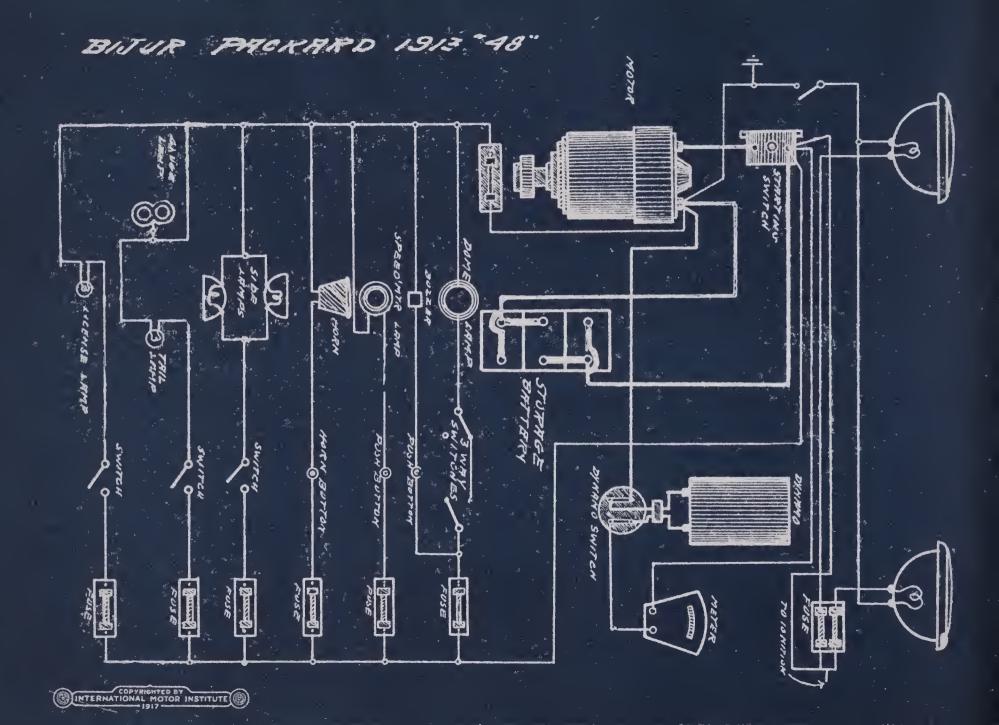
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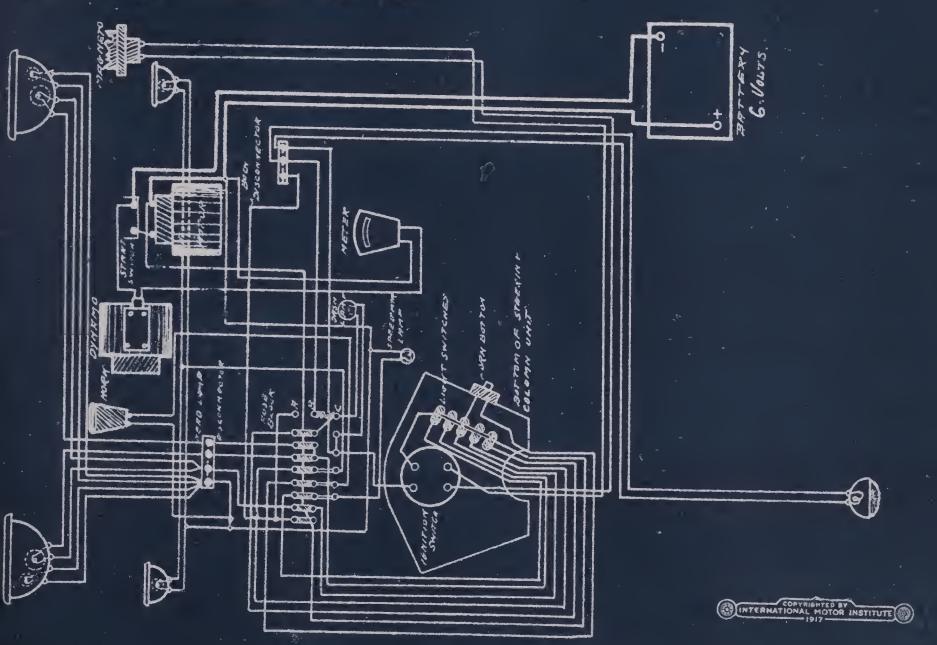


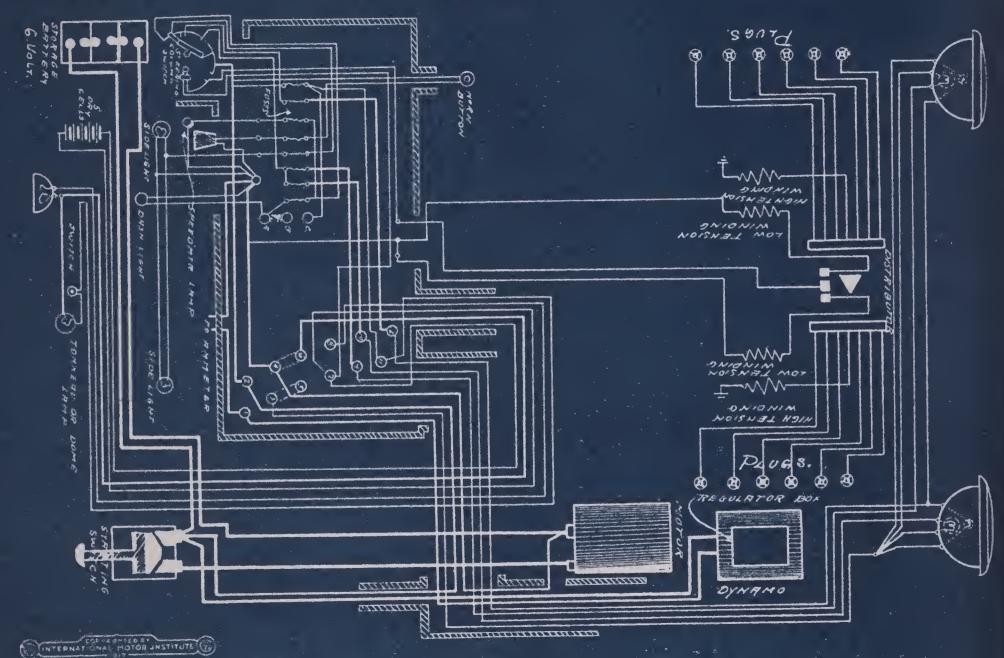


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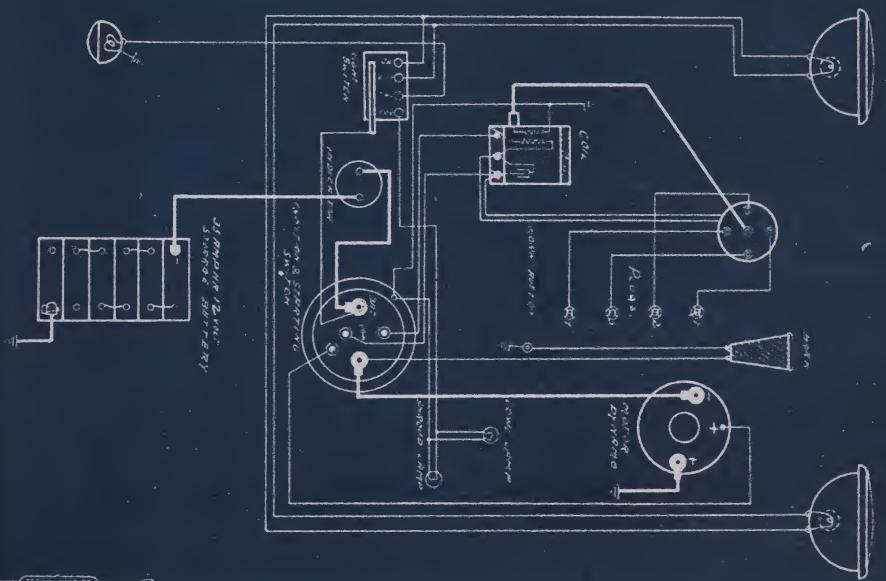


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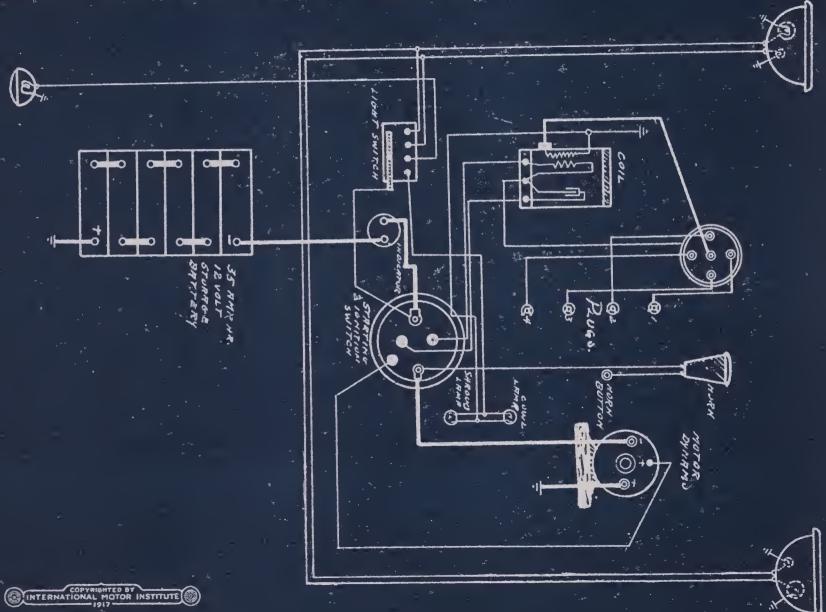


BIJUR SCRIPPS-BOOTH CARS ABOVE 1101

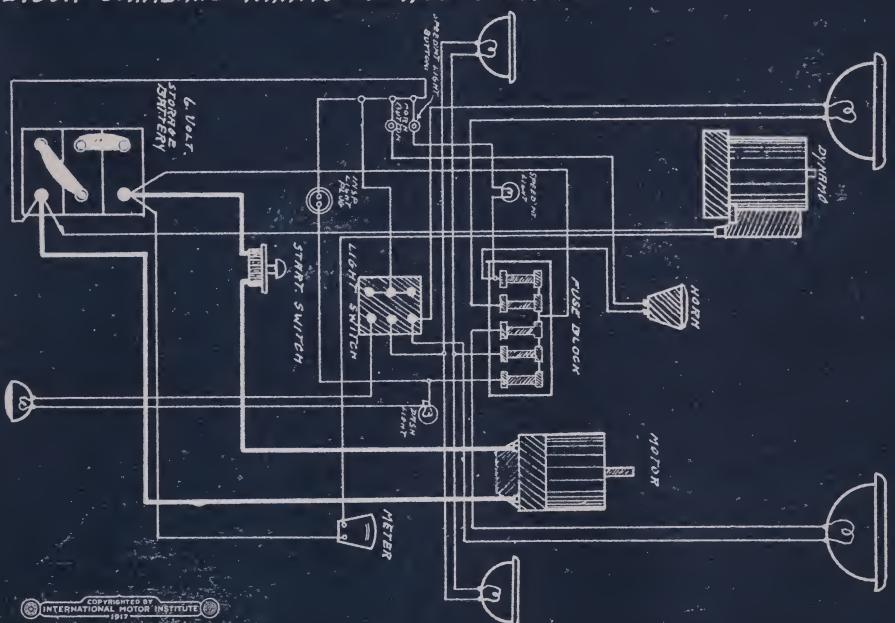


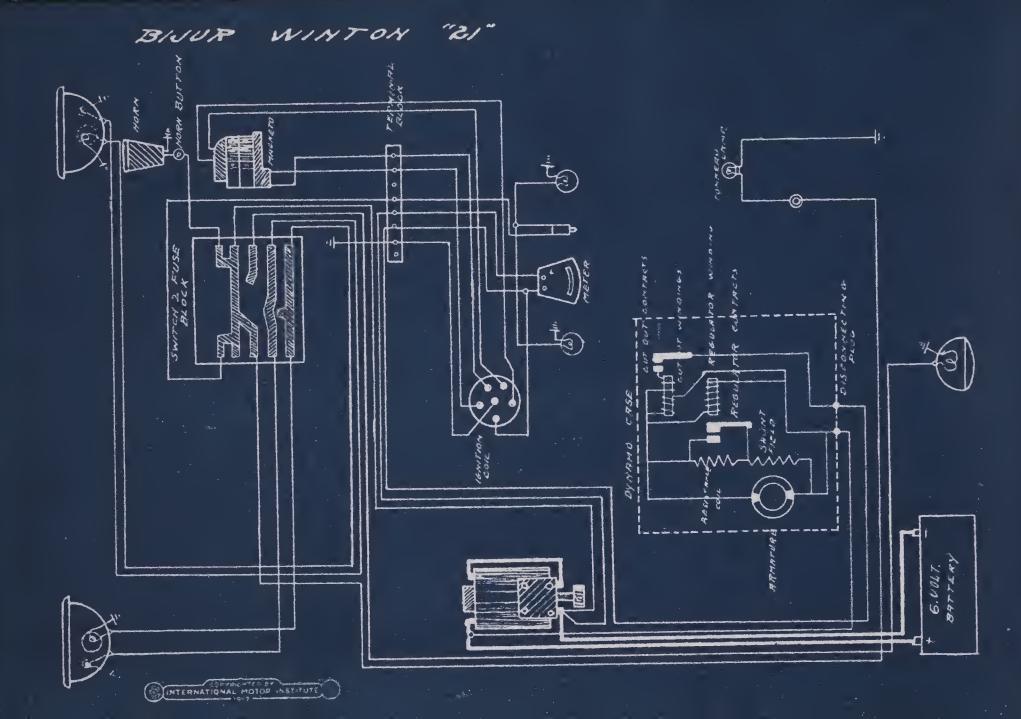
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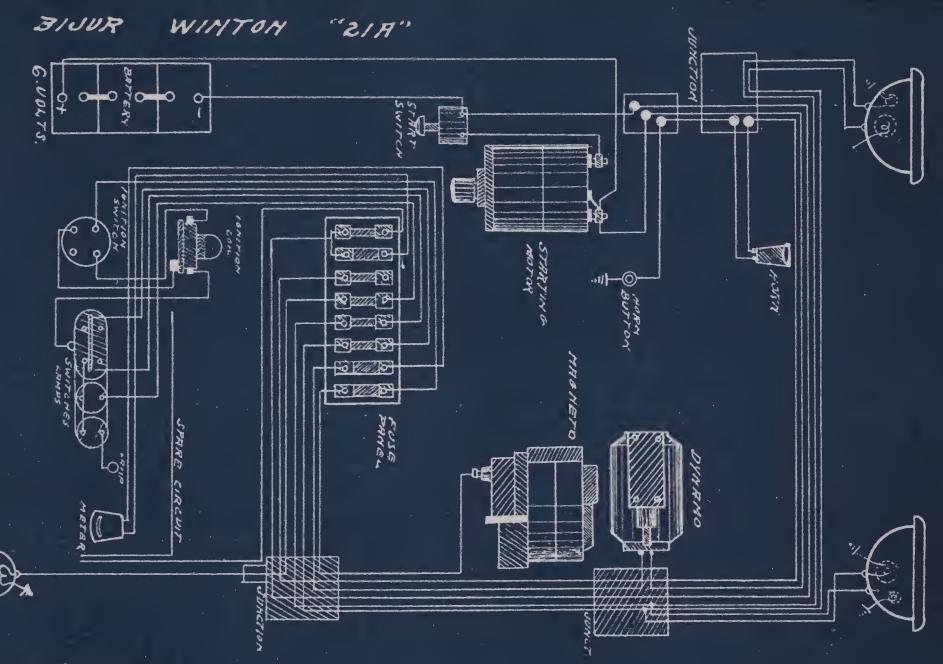
BIJUR SCRIPPS- BOOTH 1915-16

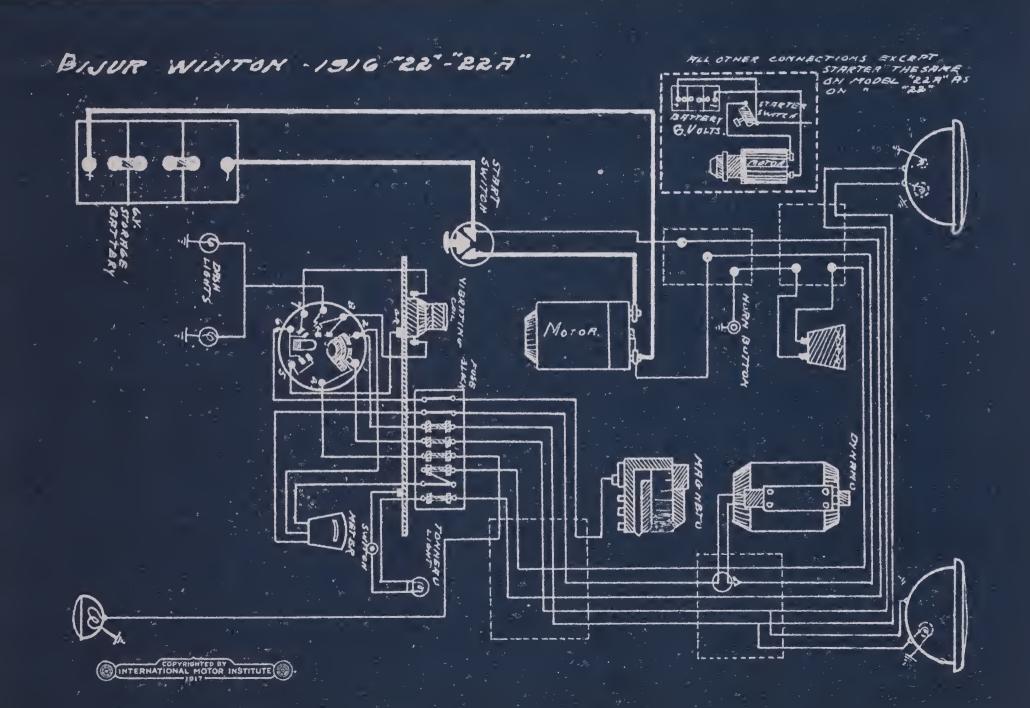


BIJUR STANDARD WIRING VOLTAGE CONTROL

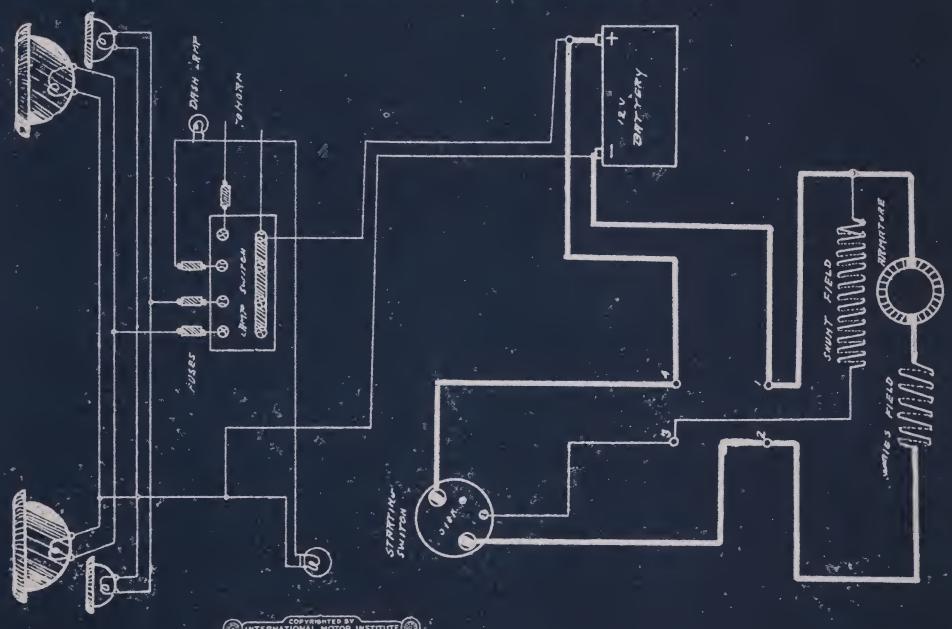




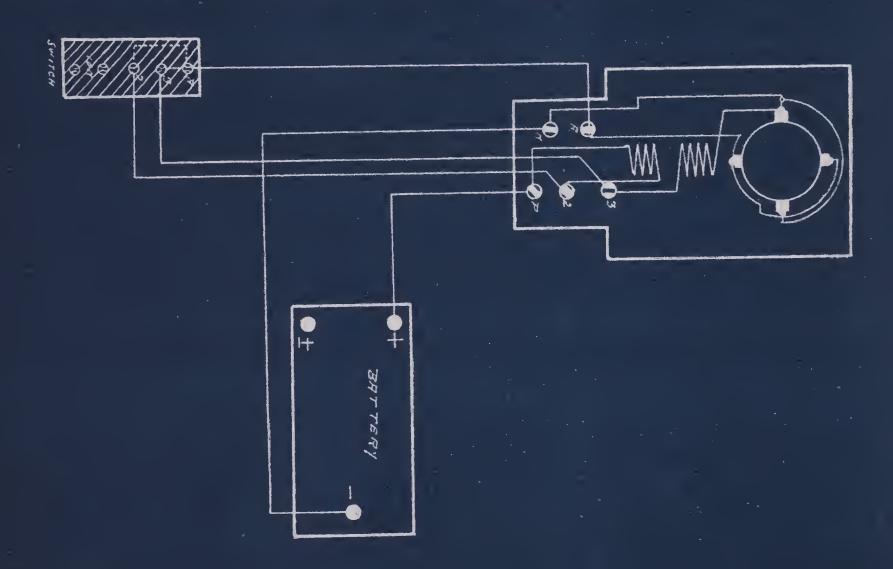




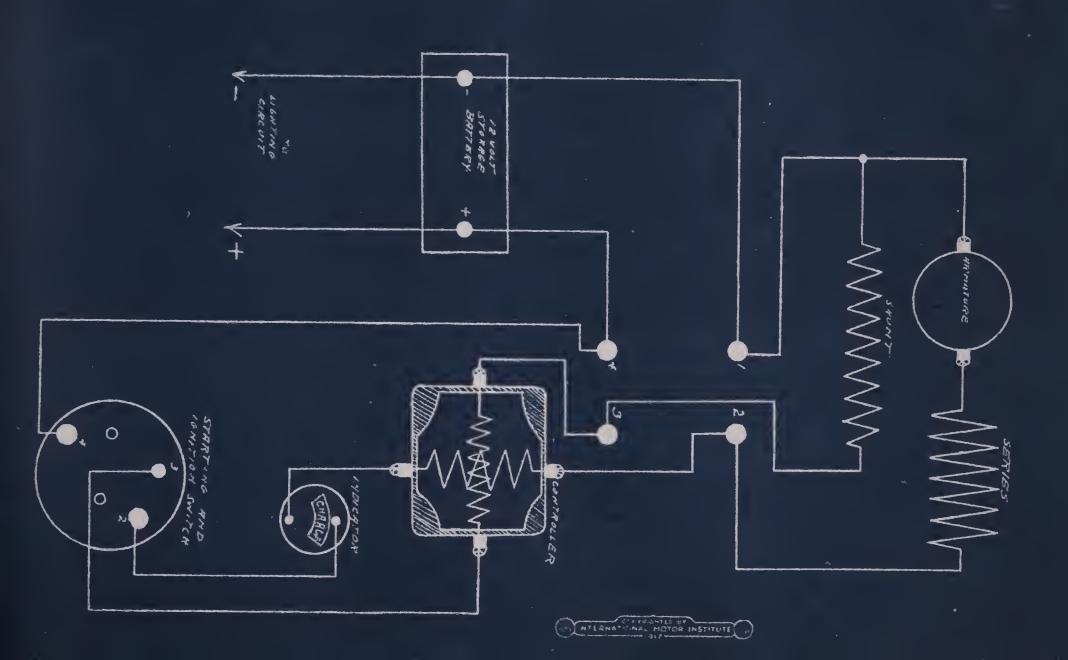
DYNETO' INTEPHAL CONNECTIONS, A TERMINAL UNIT

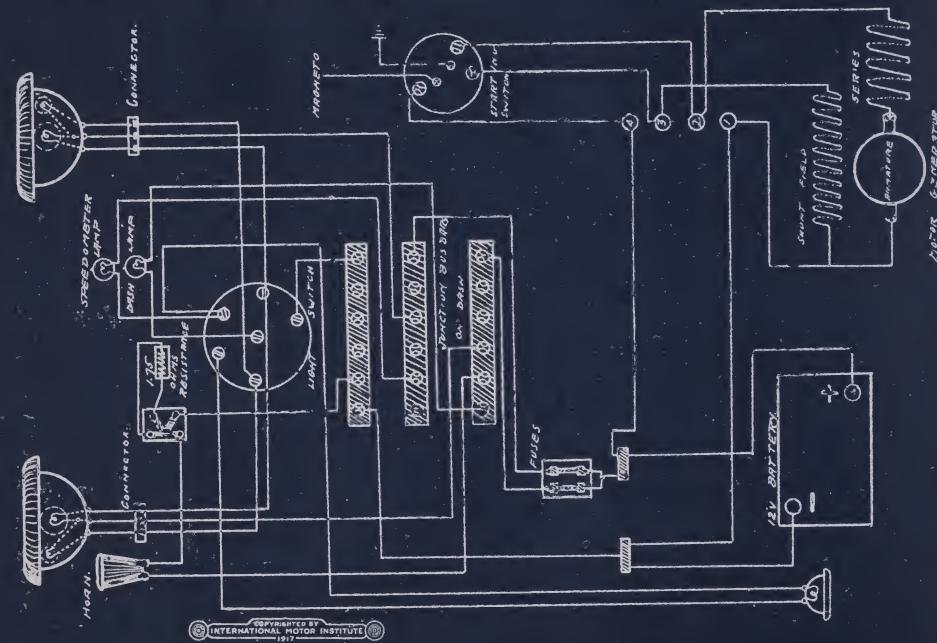


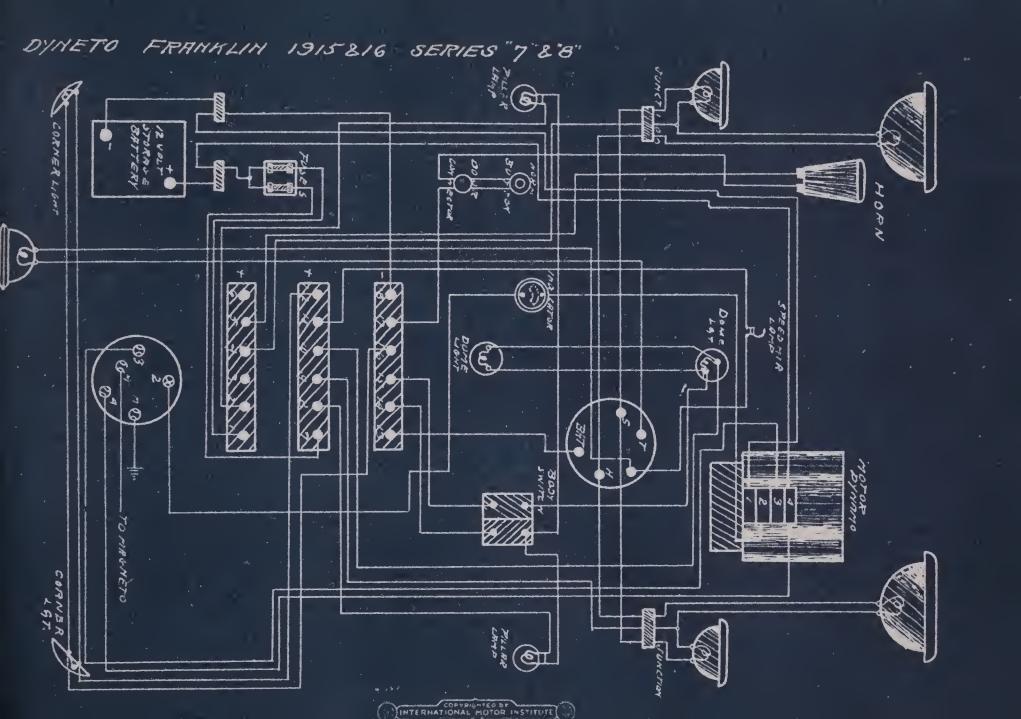
DYNETO INTERNAL CONNECTIONS, STERMINAL UNIT.



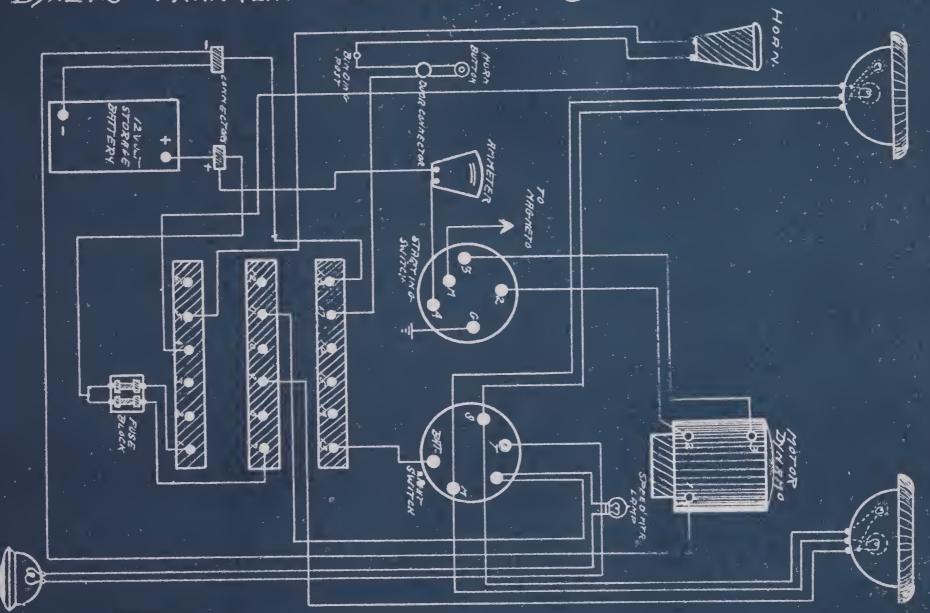




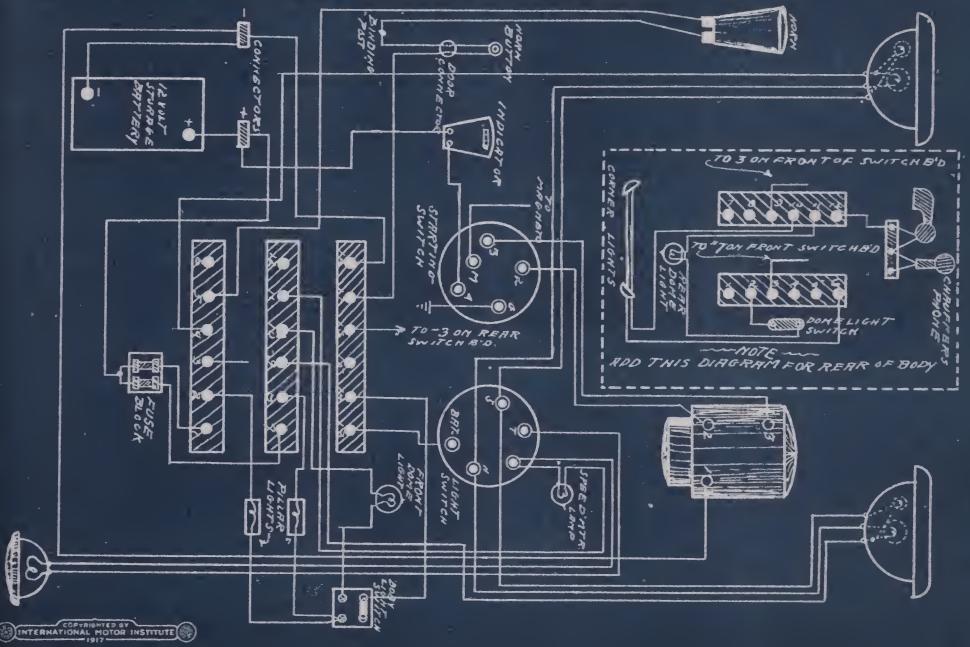




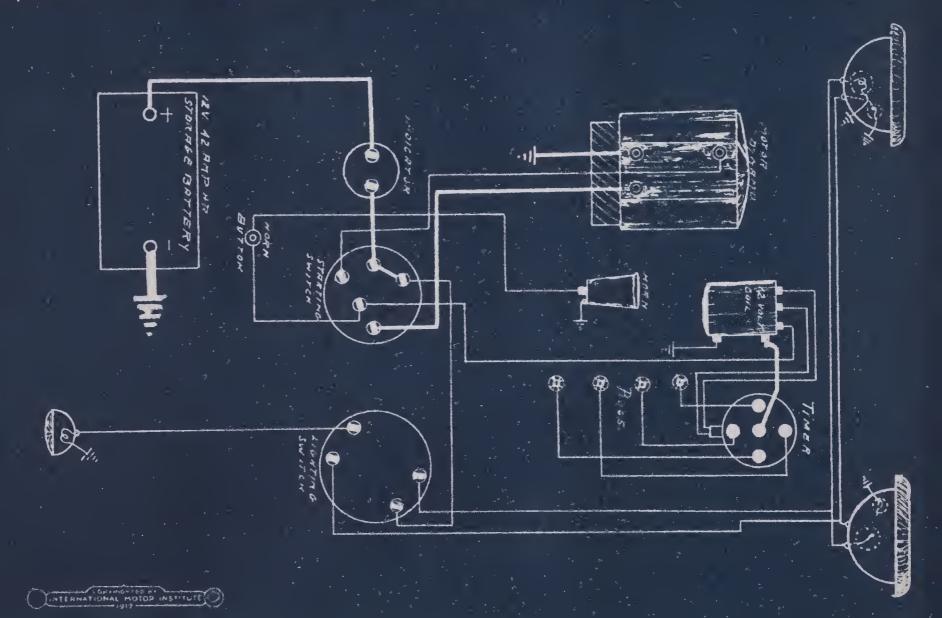
DYNETO FRANKLIN 1916. SERIES NO. 8

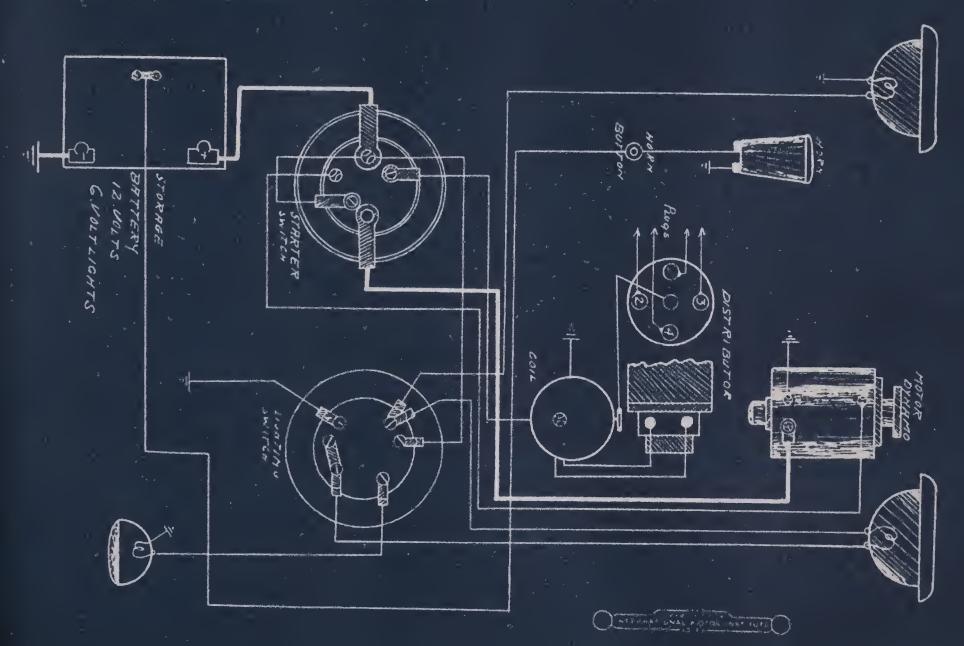


DYNETO FRANKLIN 1916 SERIES "8" BERLINE.

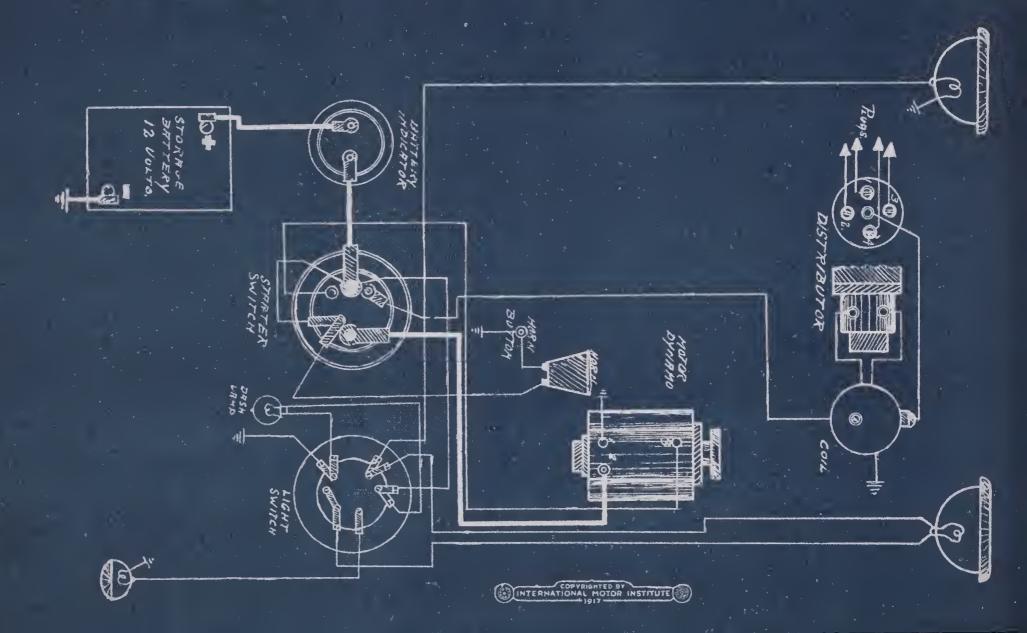


DYNETO LIPPARD STEWART TRUCK.

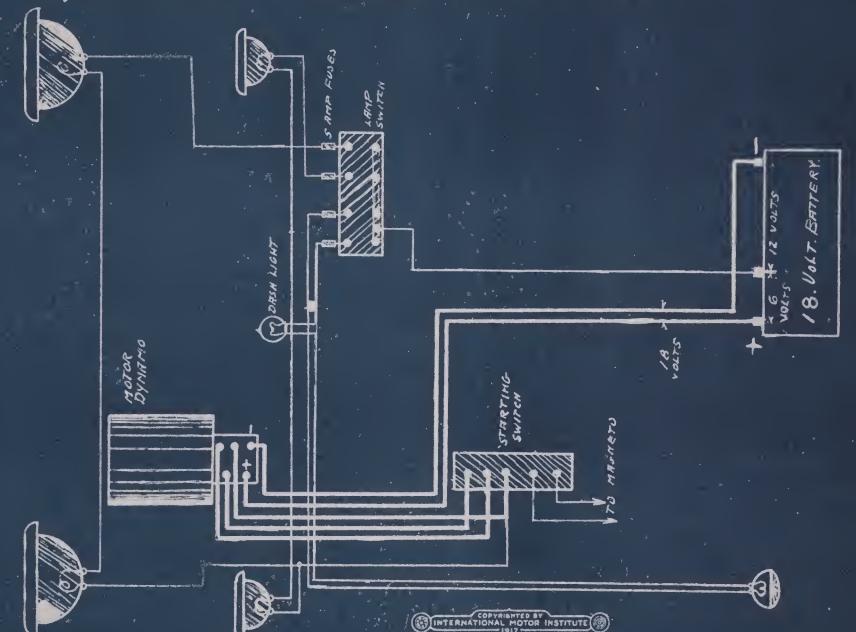




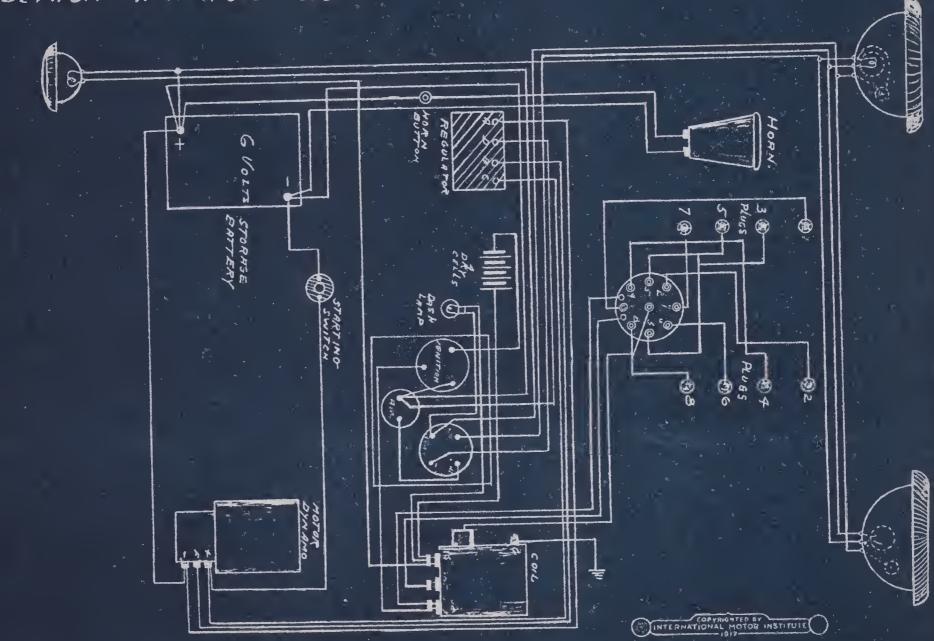
DYMETO REGAL 1915-16 "4" 8:6"

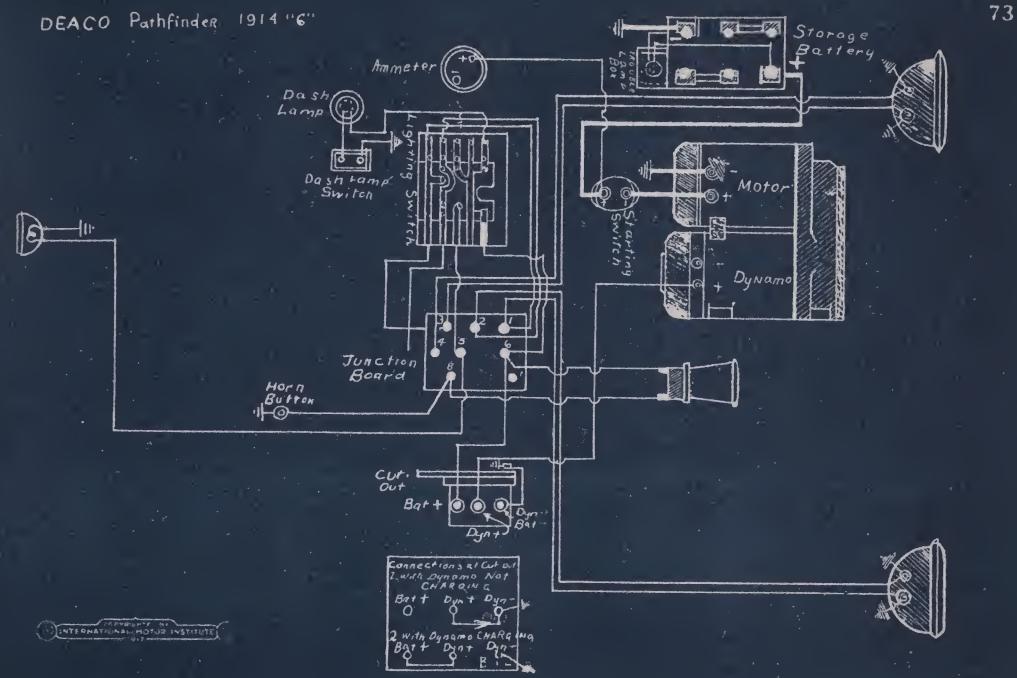


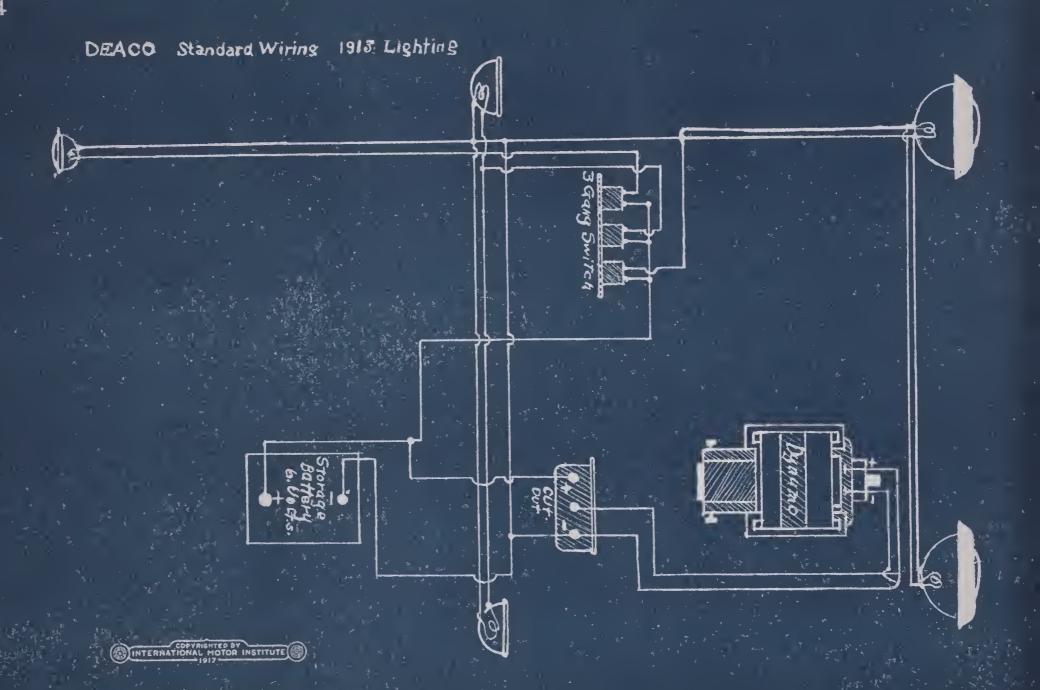
DYMETO-ENTZ STAMDARD WIRING 1913

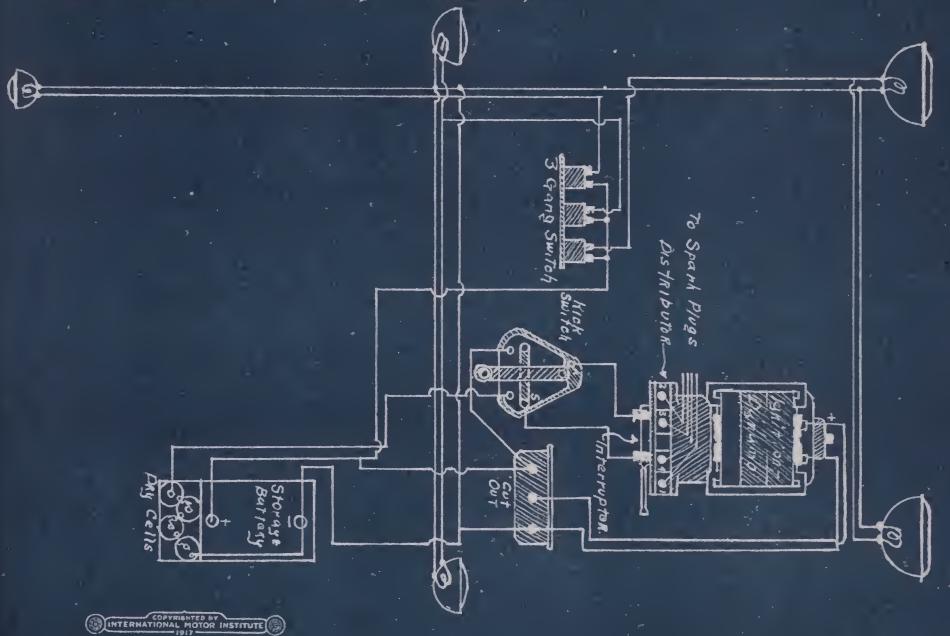


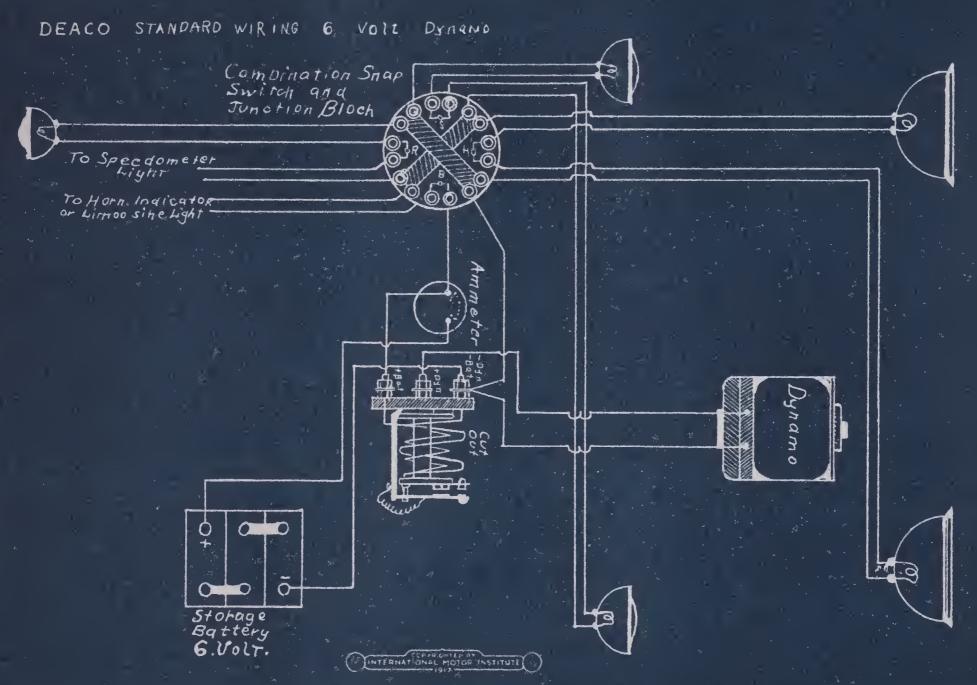
DETROIT W.L. POSS 1916 "8"



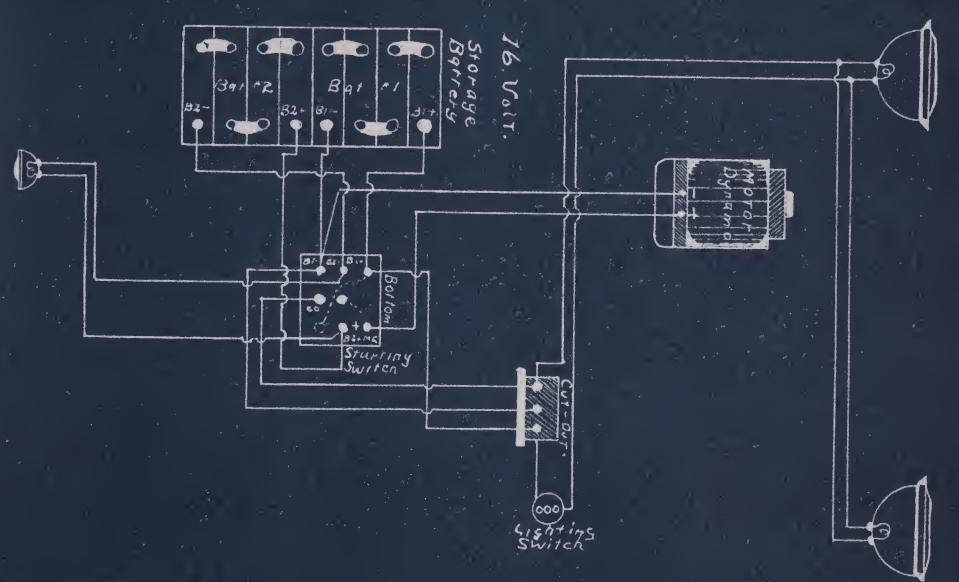




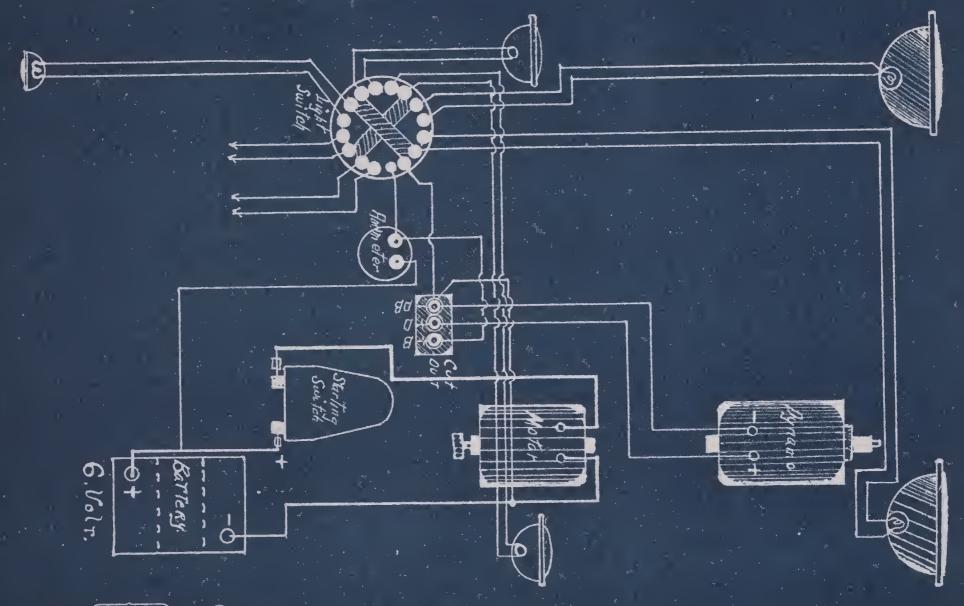


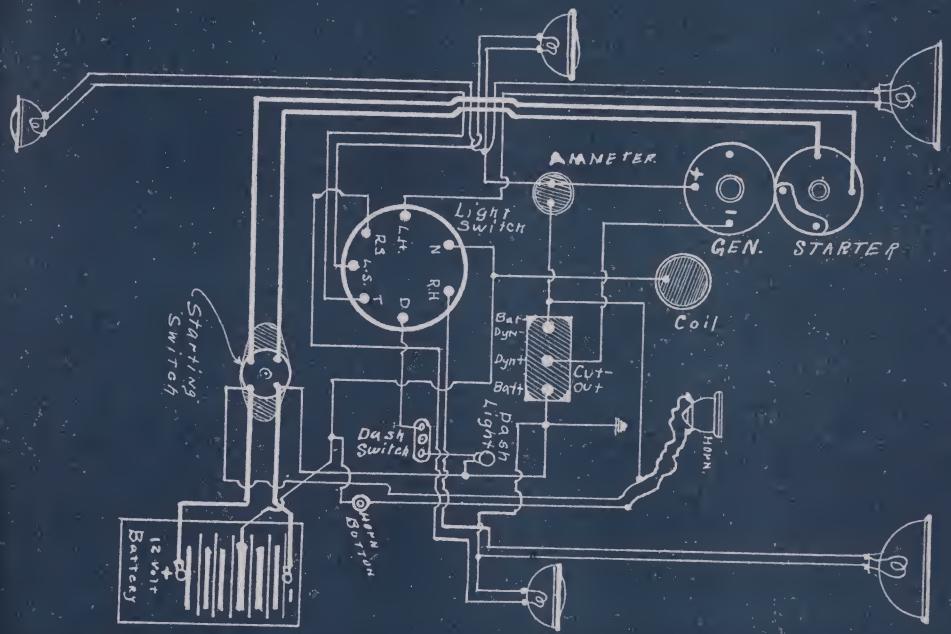


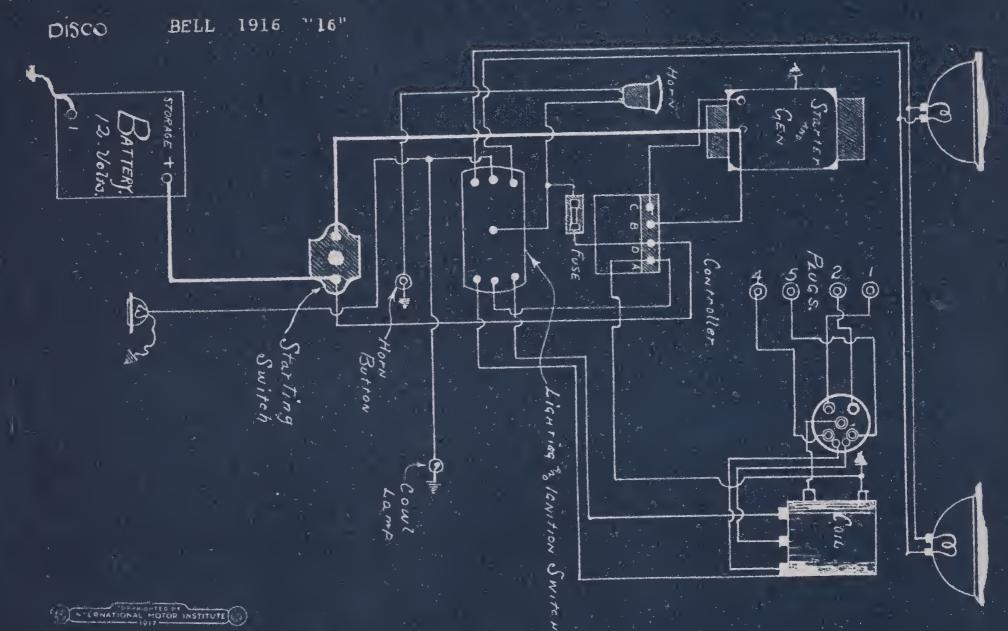
DEACO Standard Wiring 8-16 Volt System.

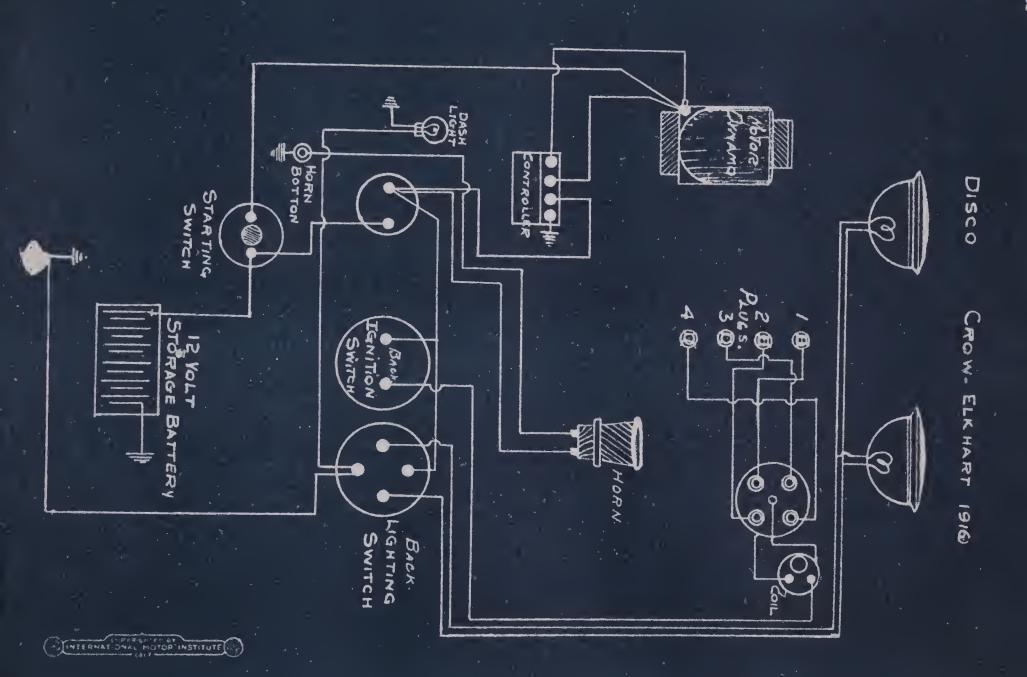


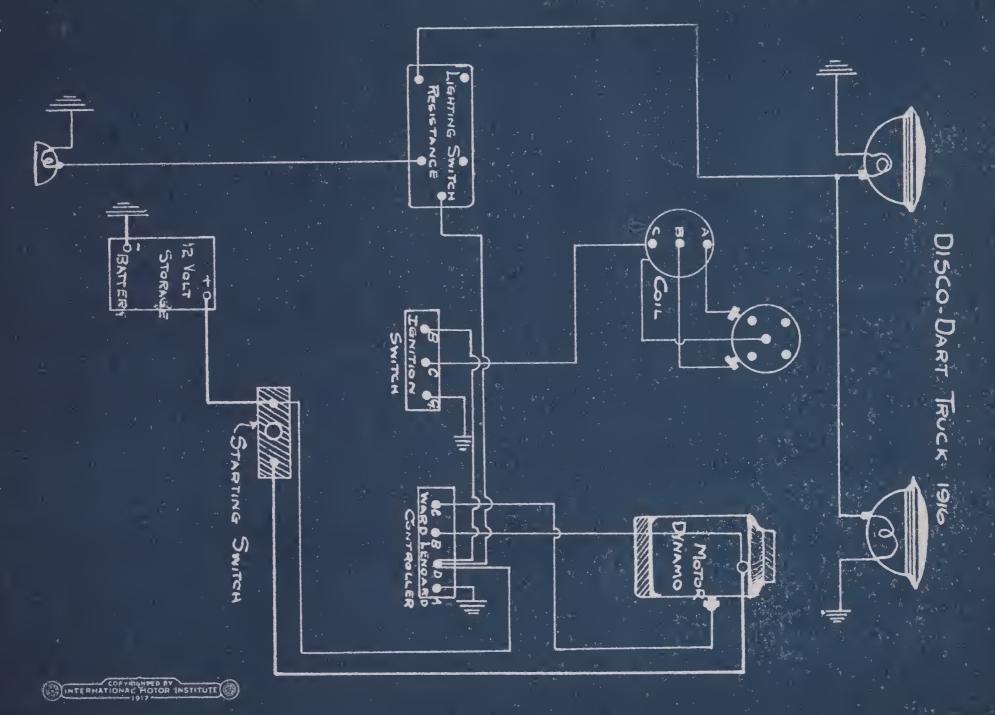
DEACO Standard Wiring 1914-15 Separate Units

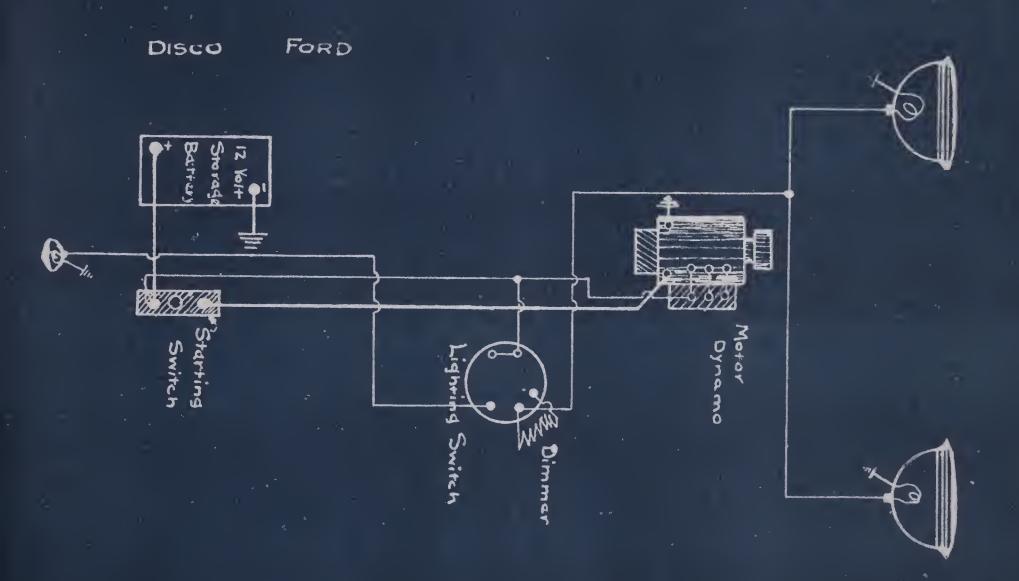




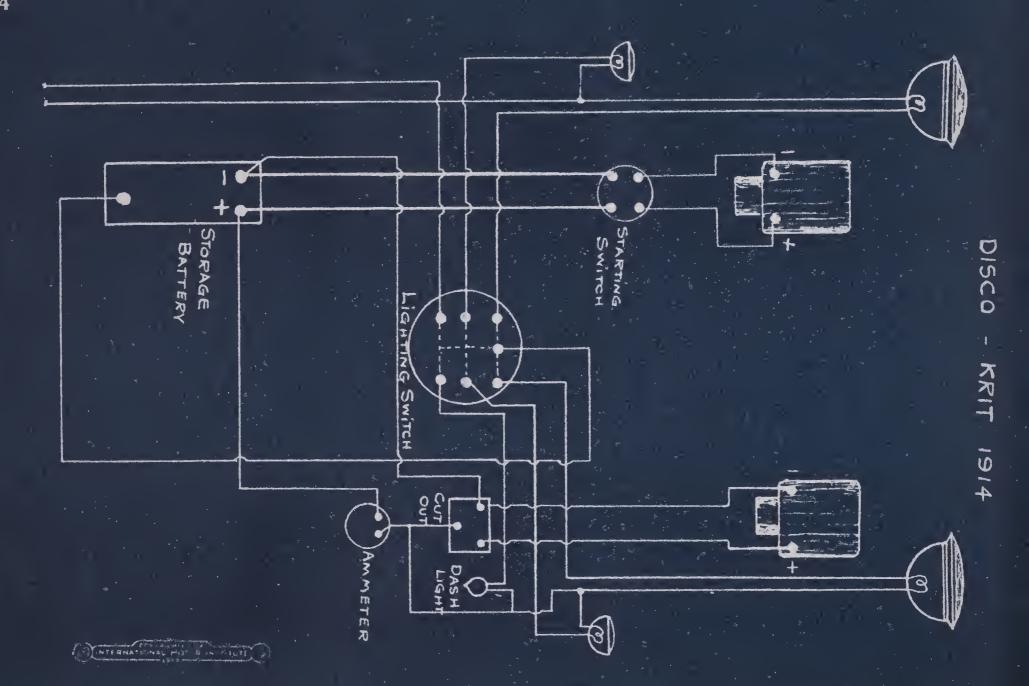


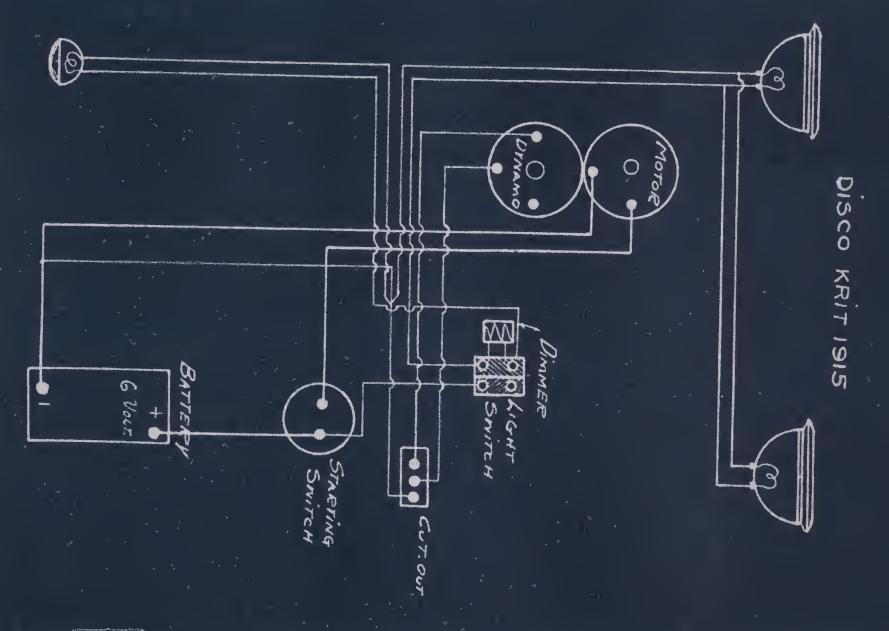




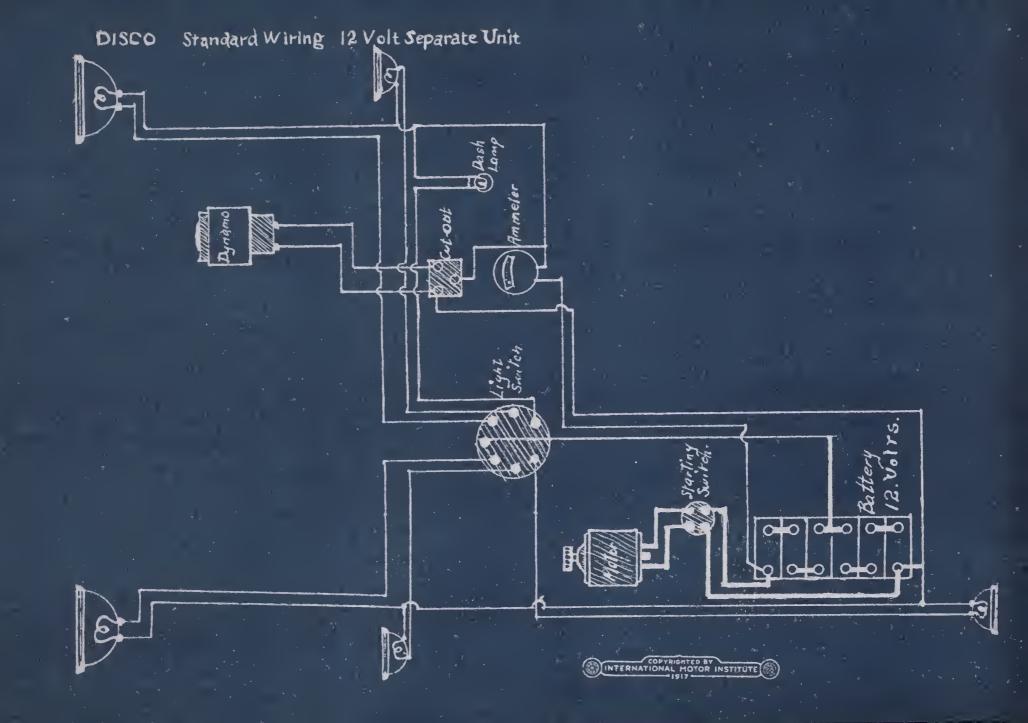


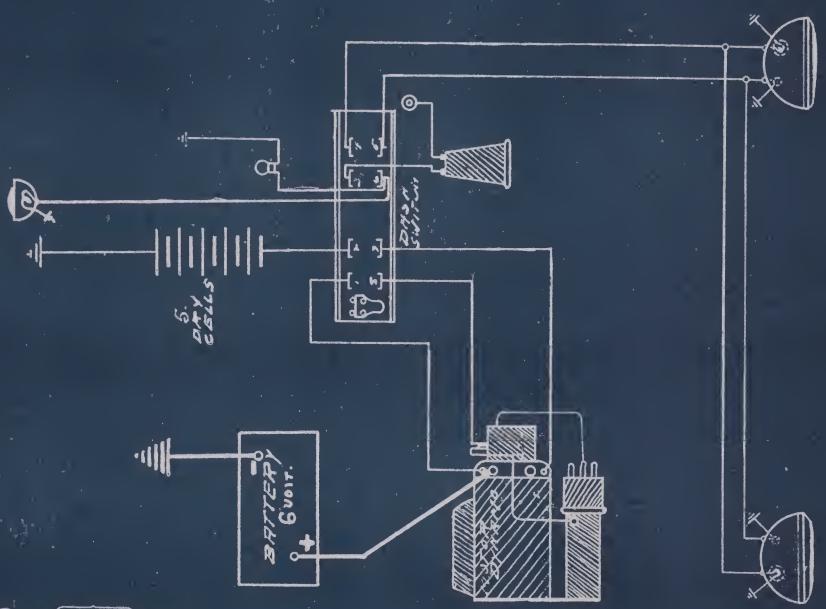






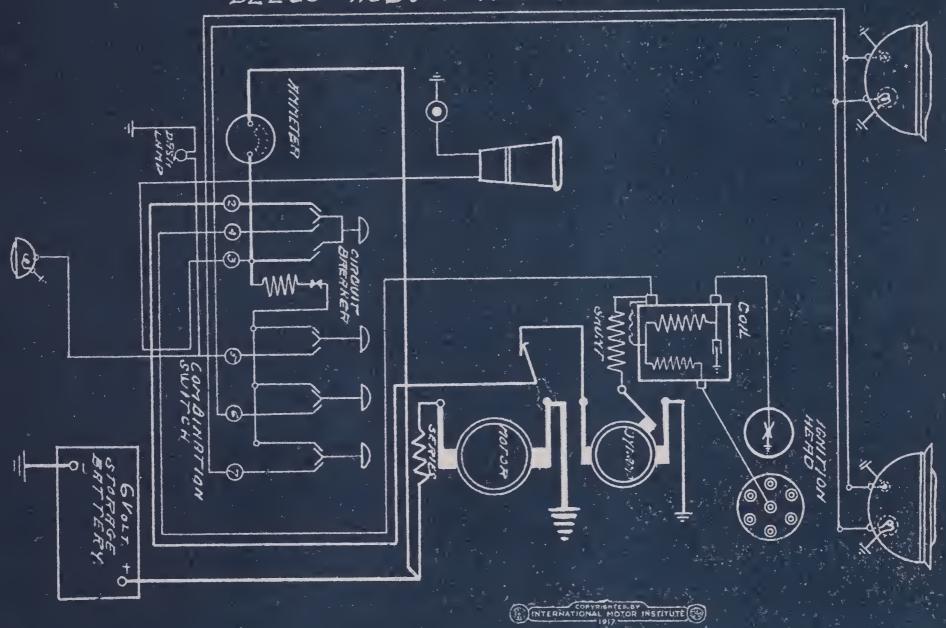
CINTERNATIONAL MOSTOR INSECTE I

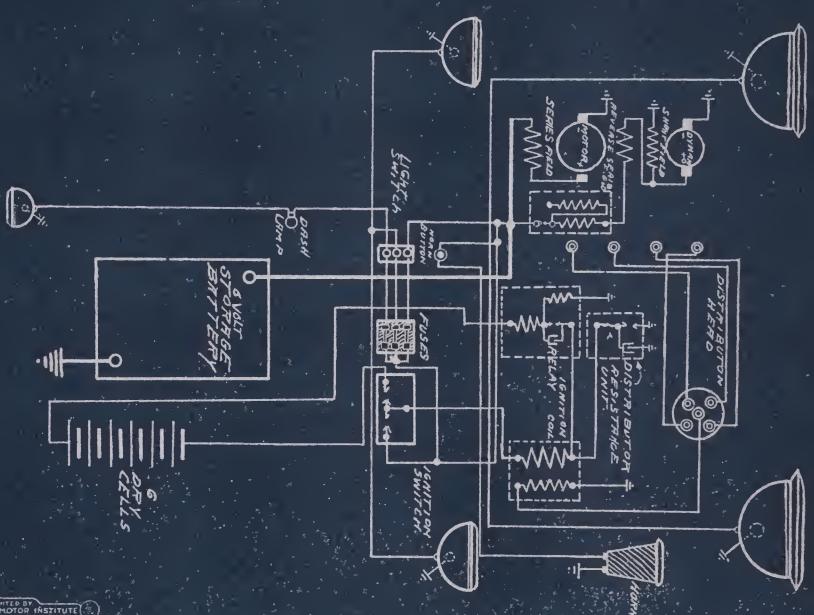




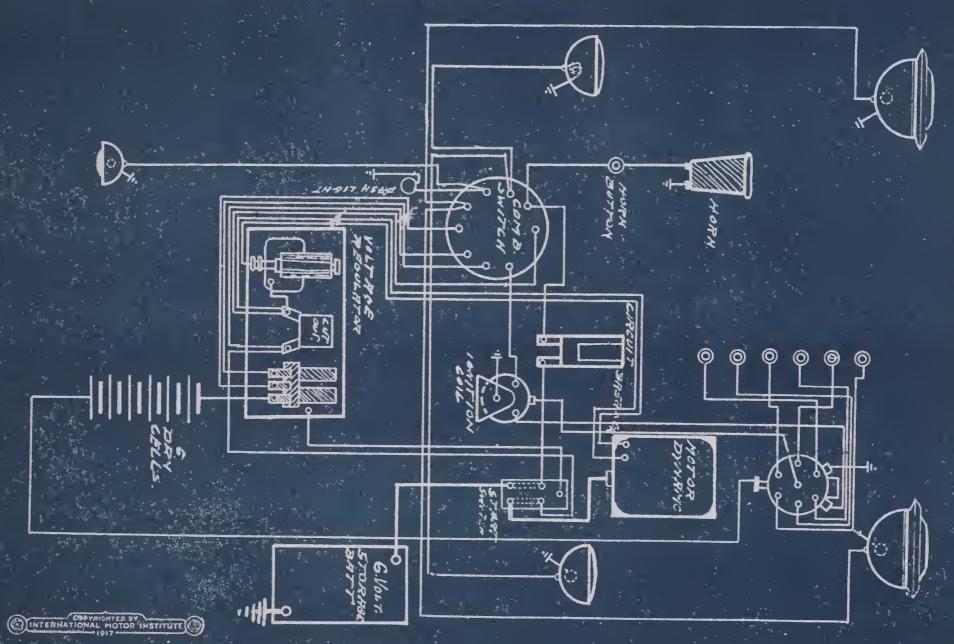
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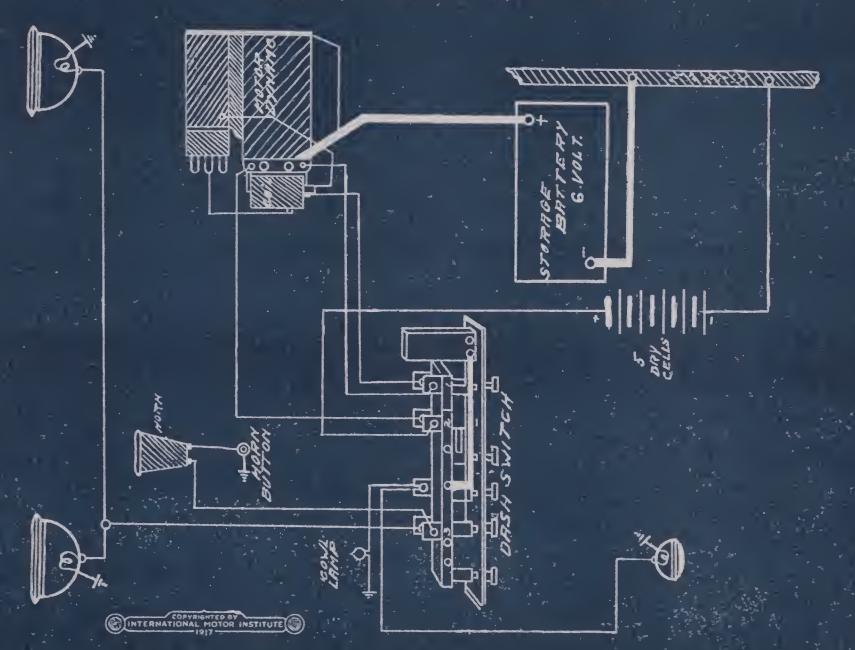
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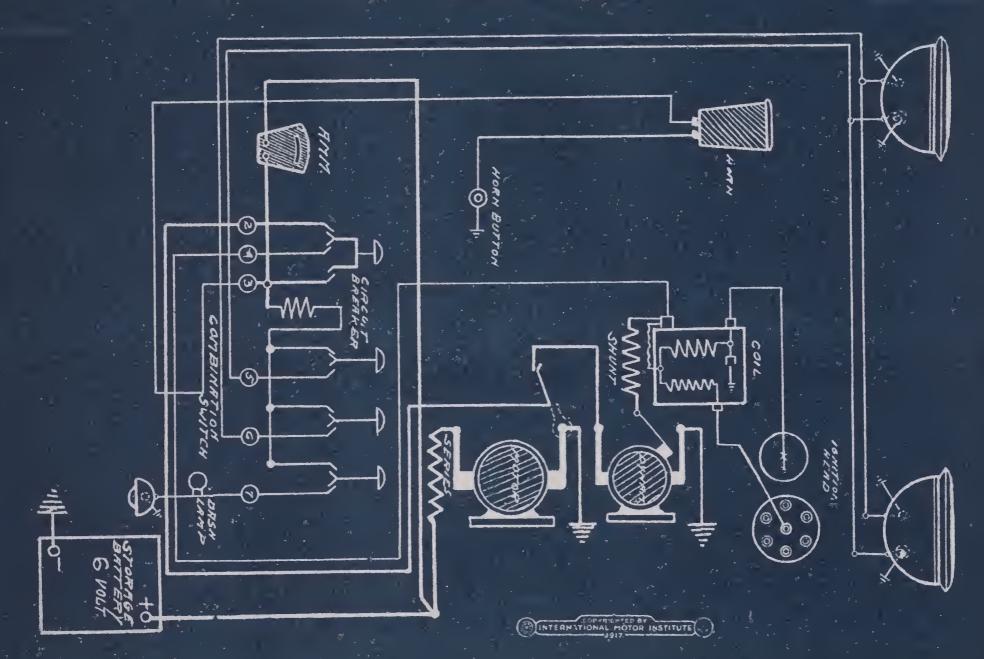


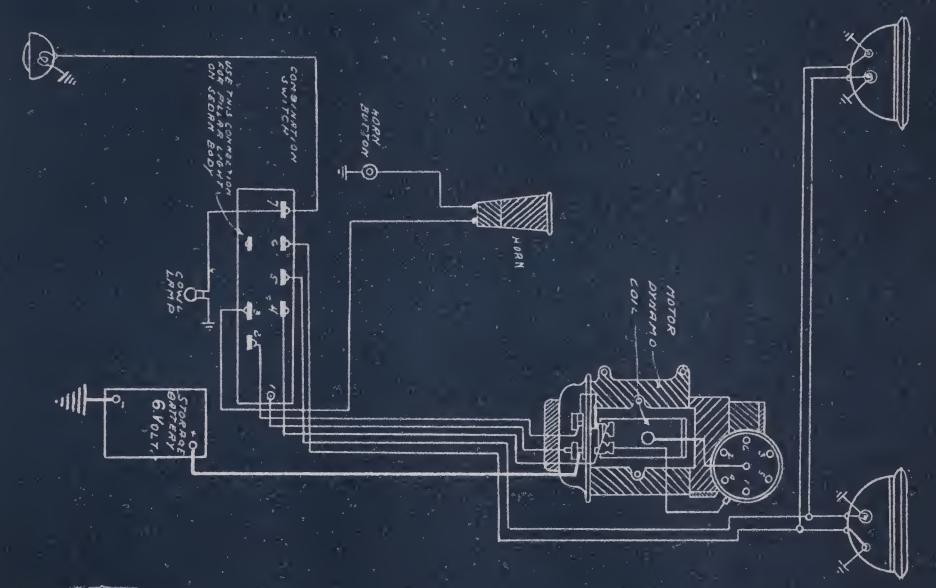


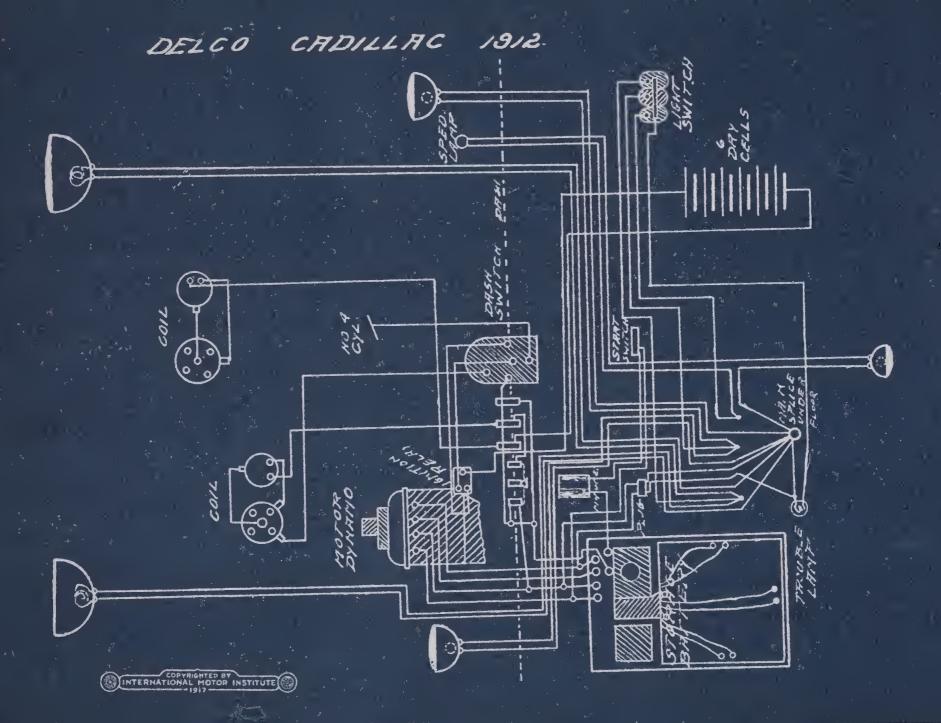
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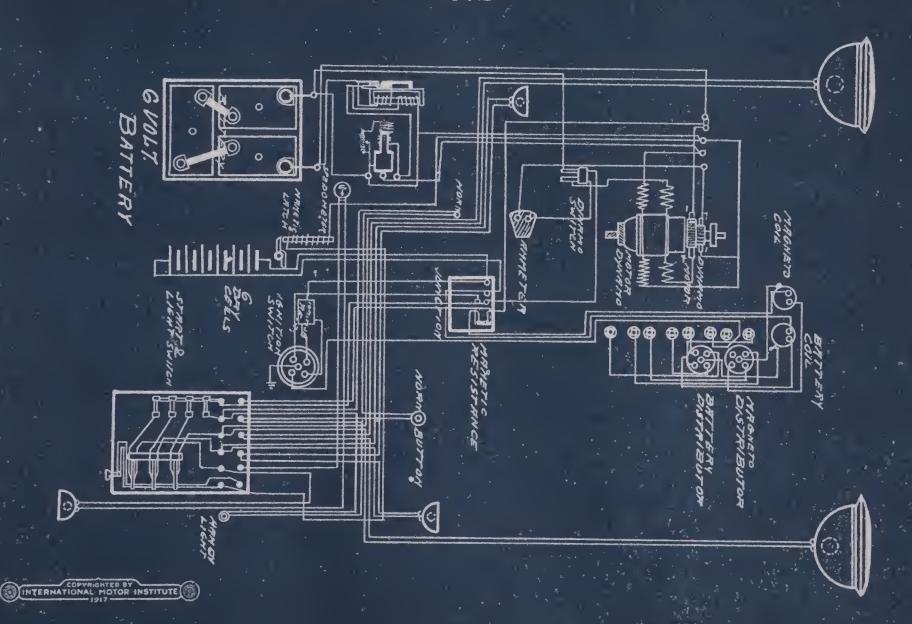


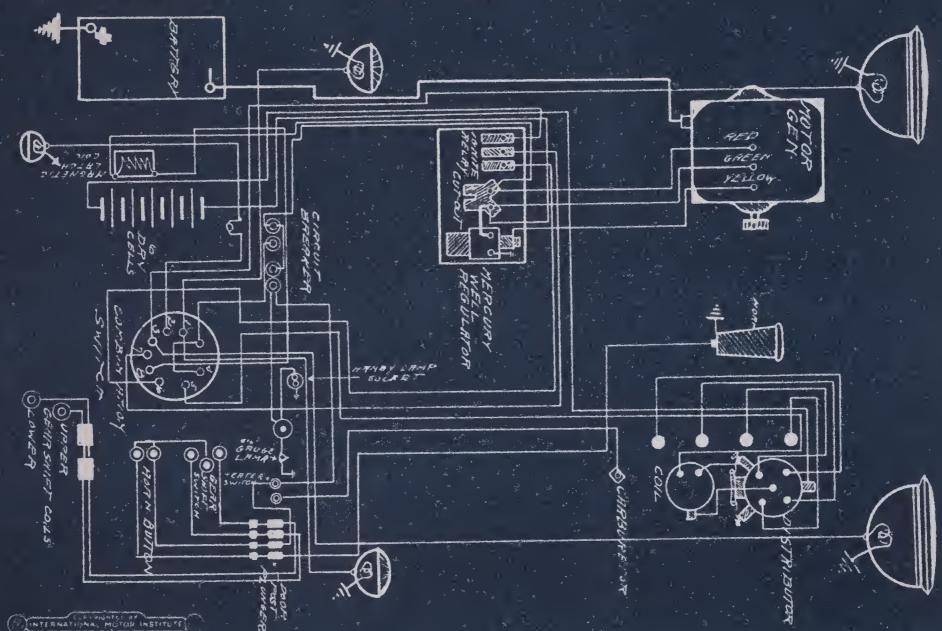


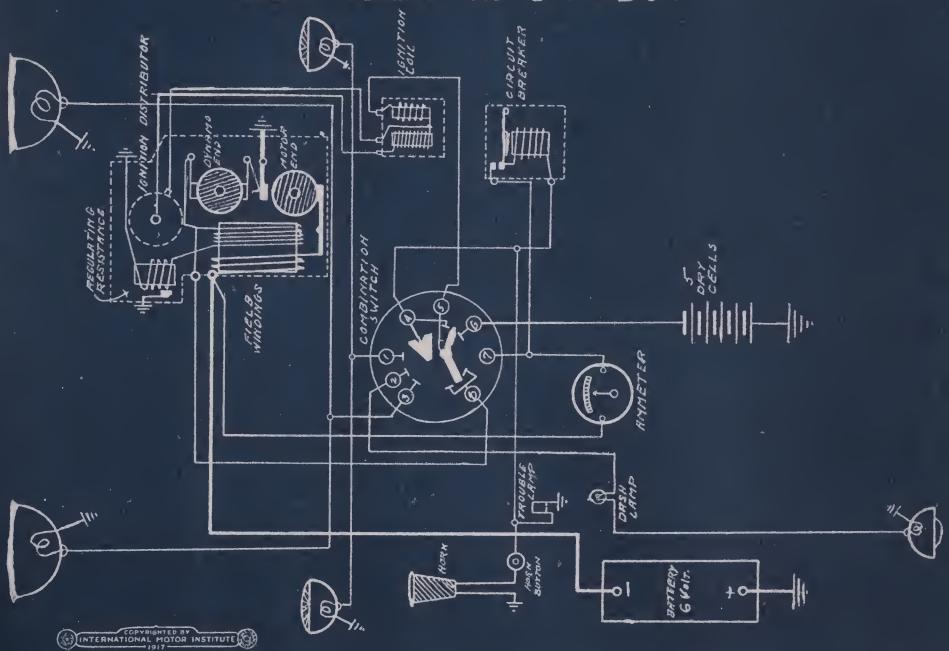




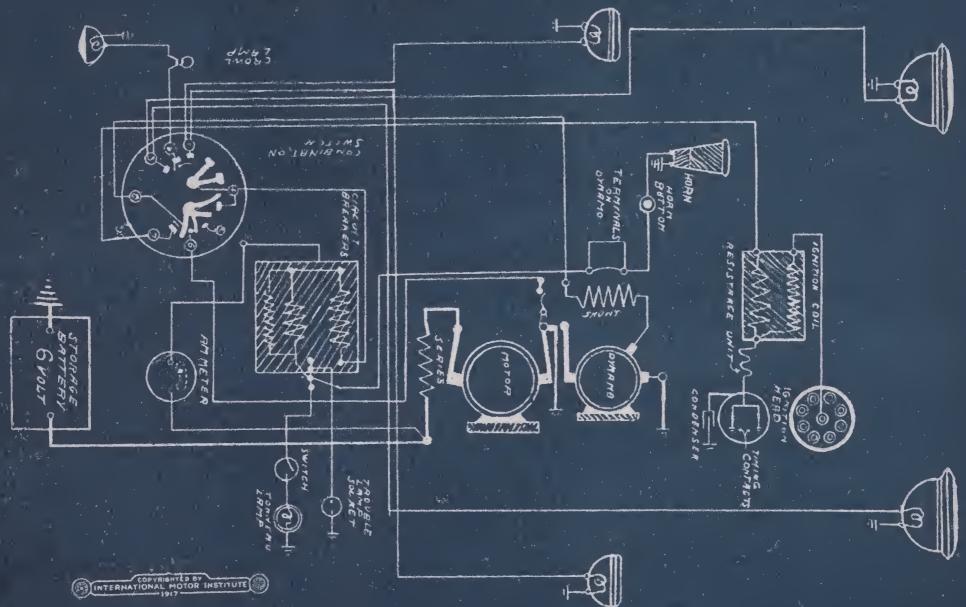


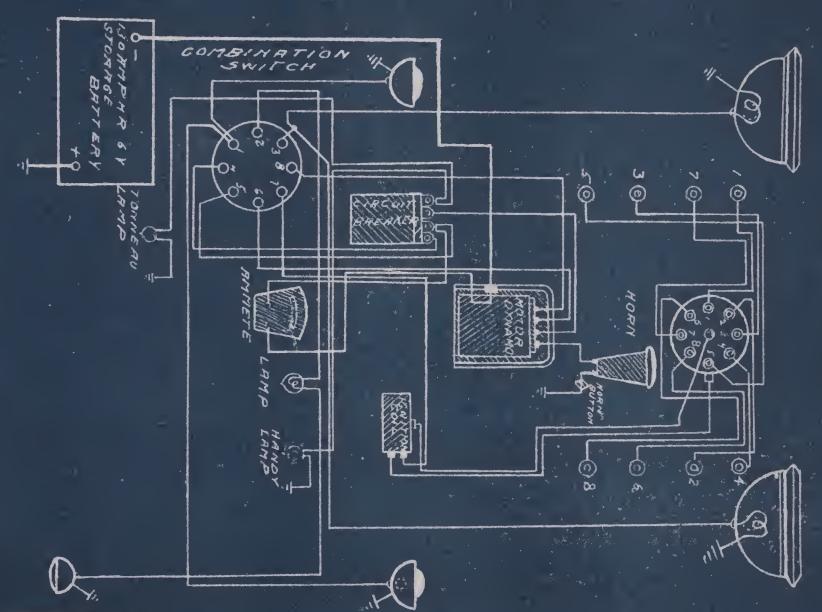






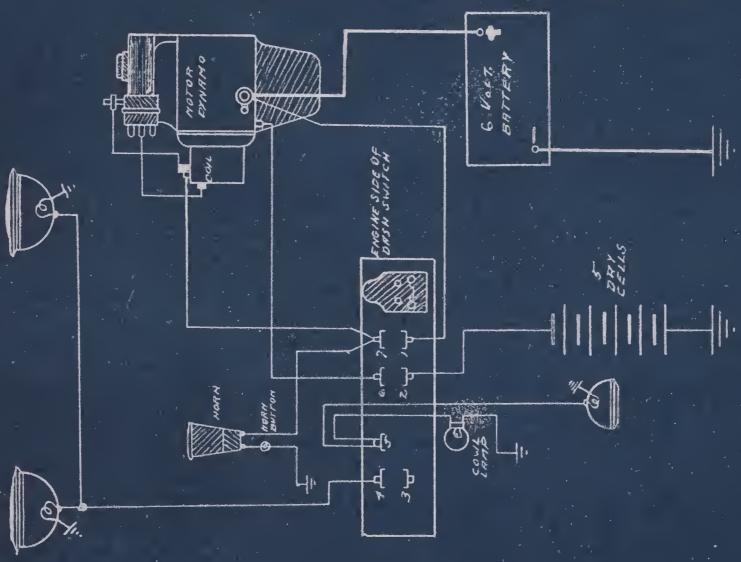
DELCO CADILLAC: 55 1916 INTERNAL



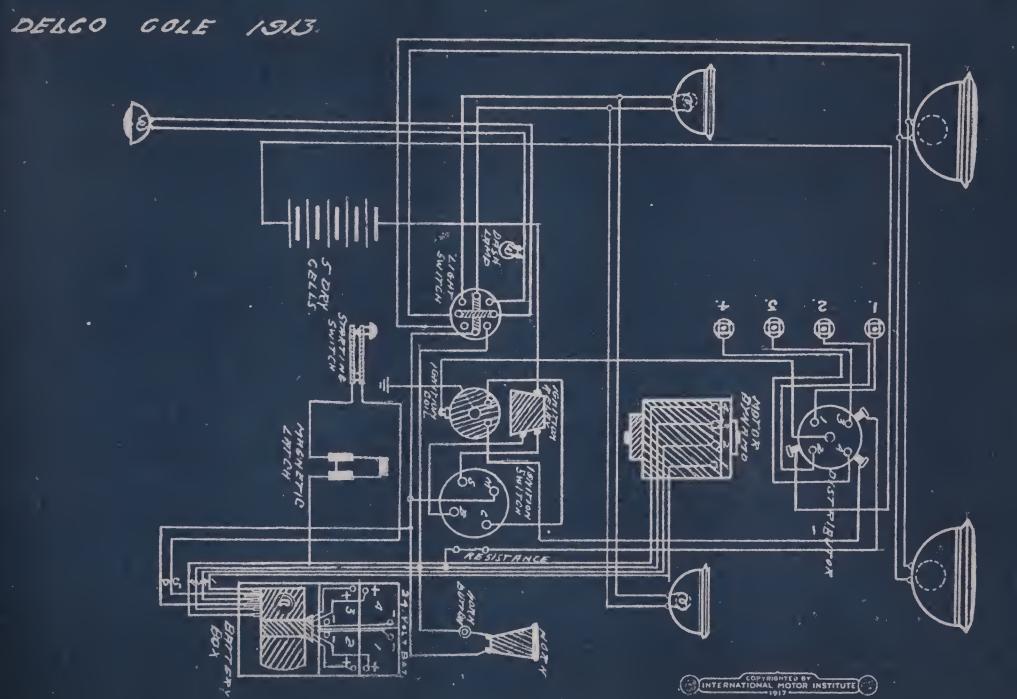


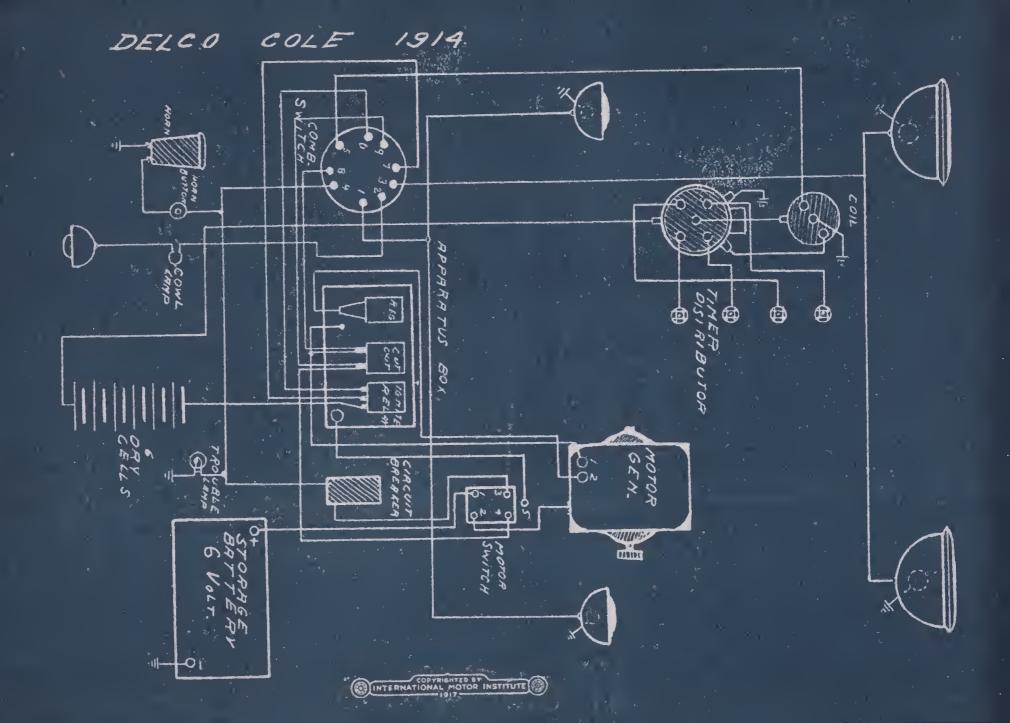
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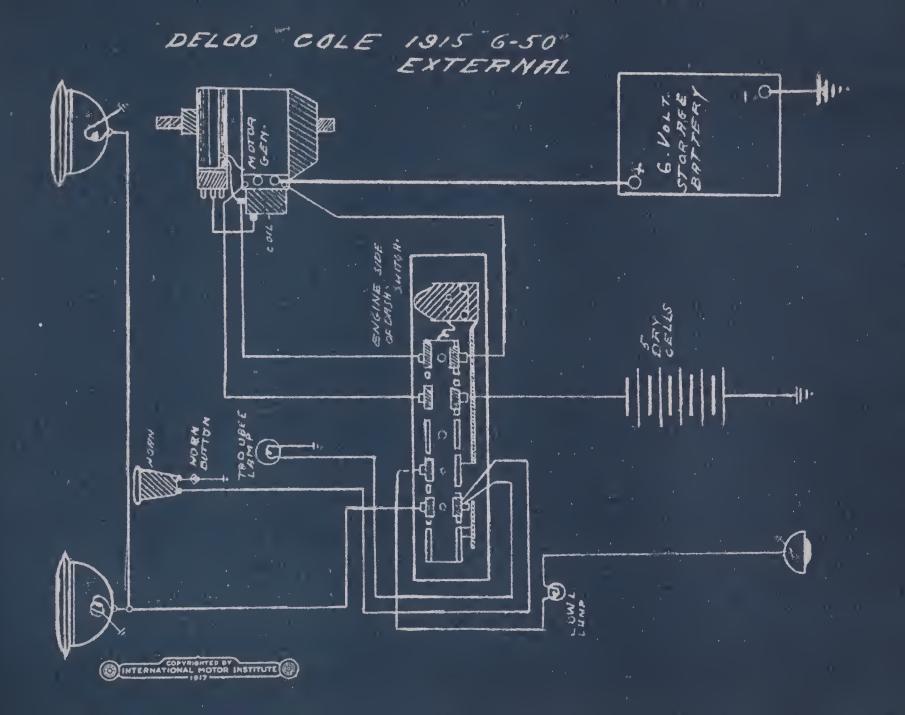
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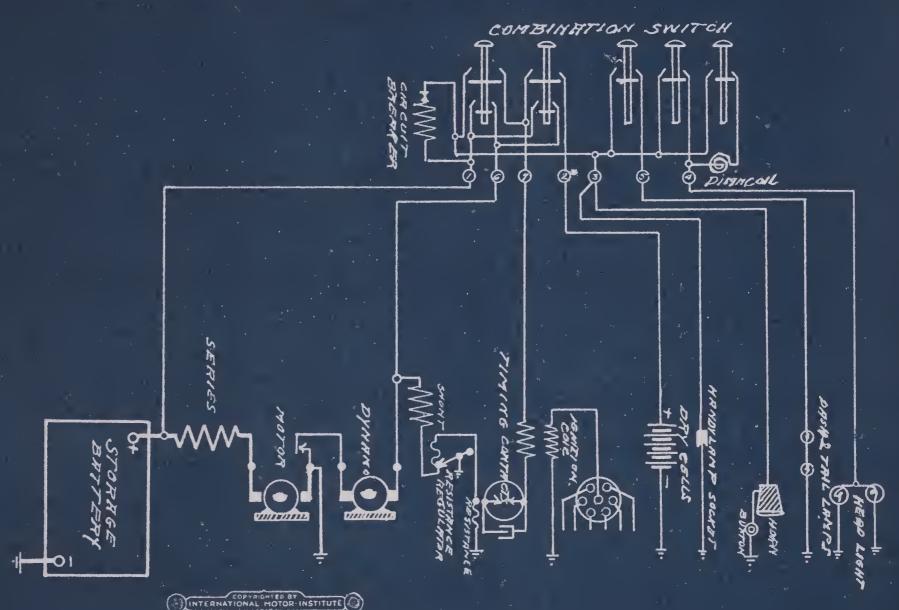
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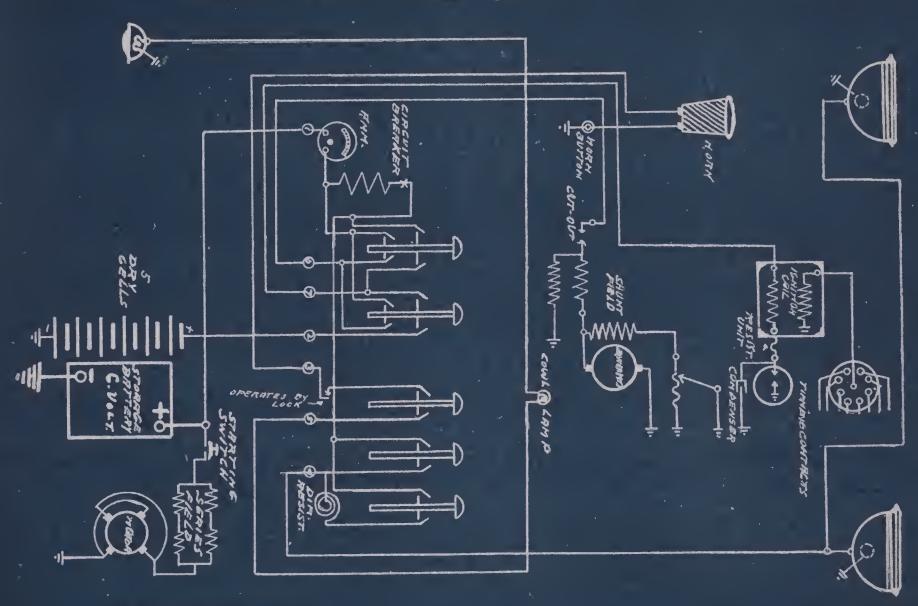


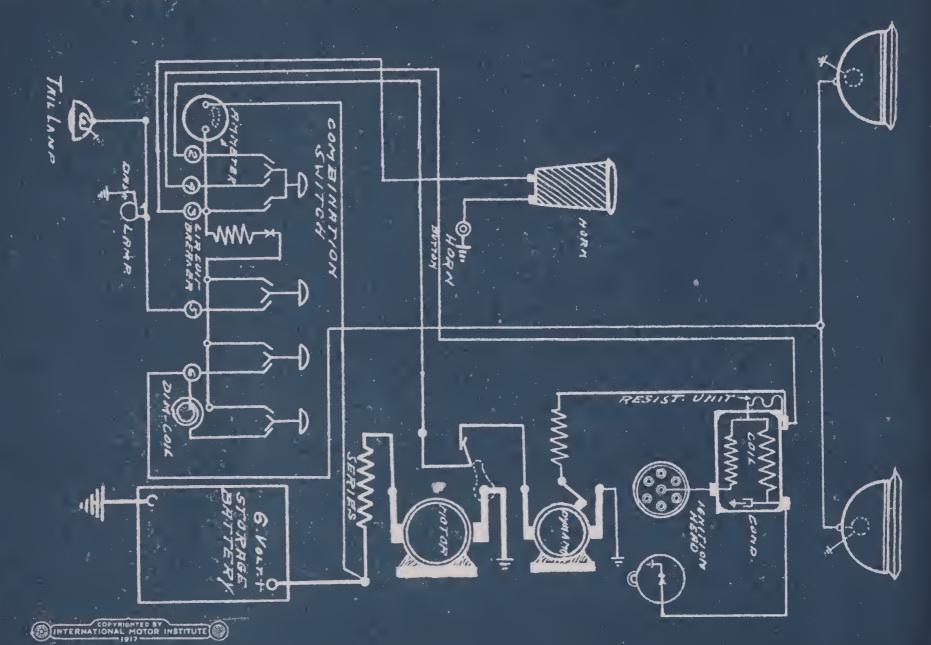


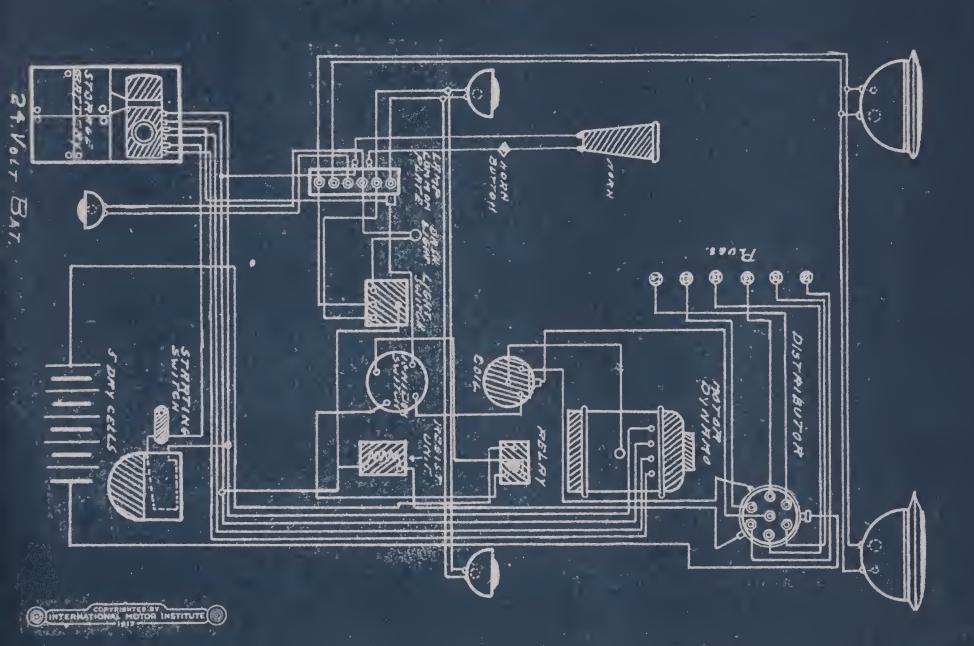


DECCO COLE 1915 "6-50" INTERNAL

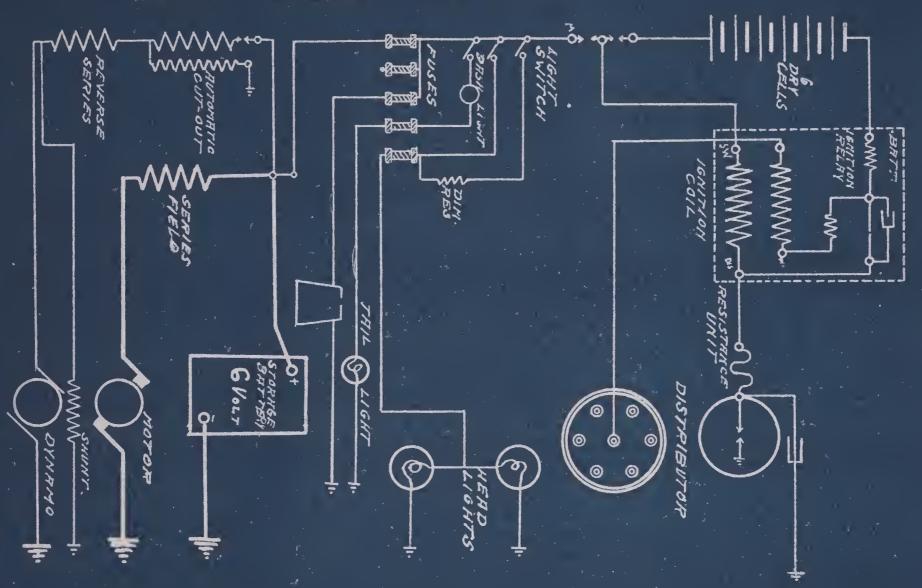


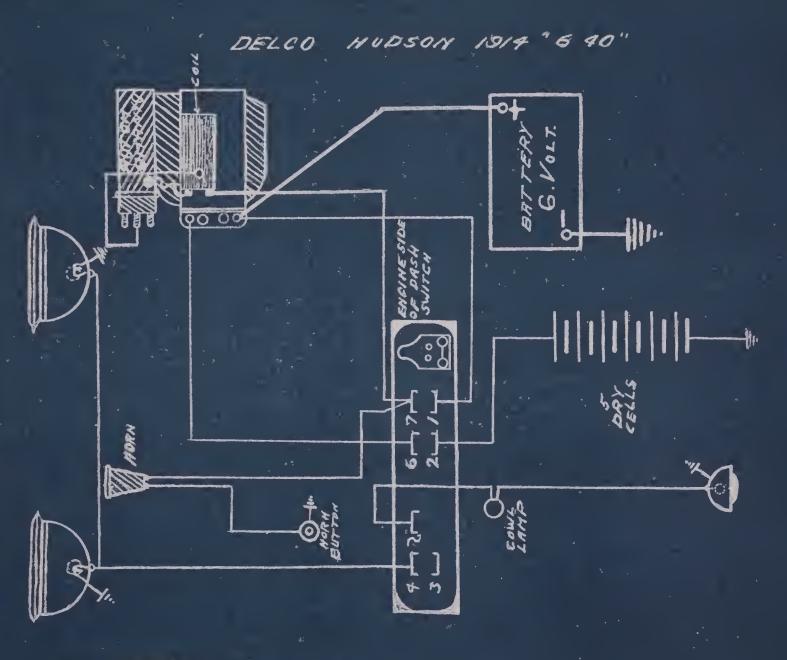




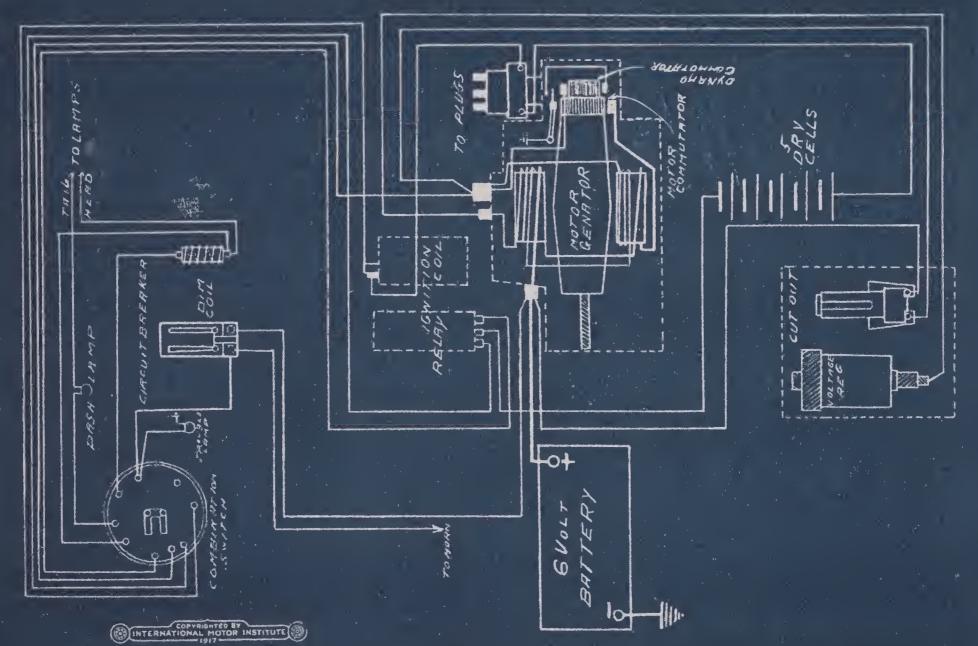


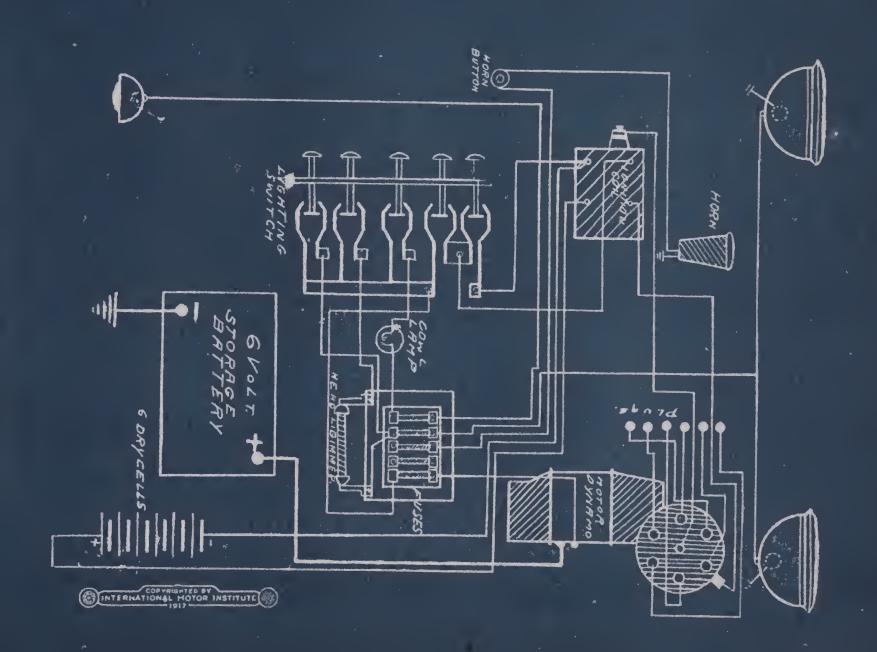
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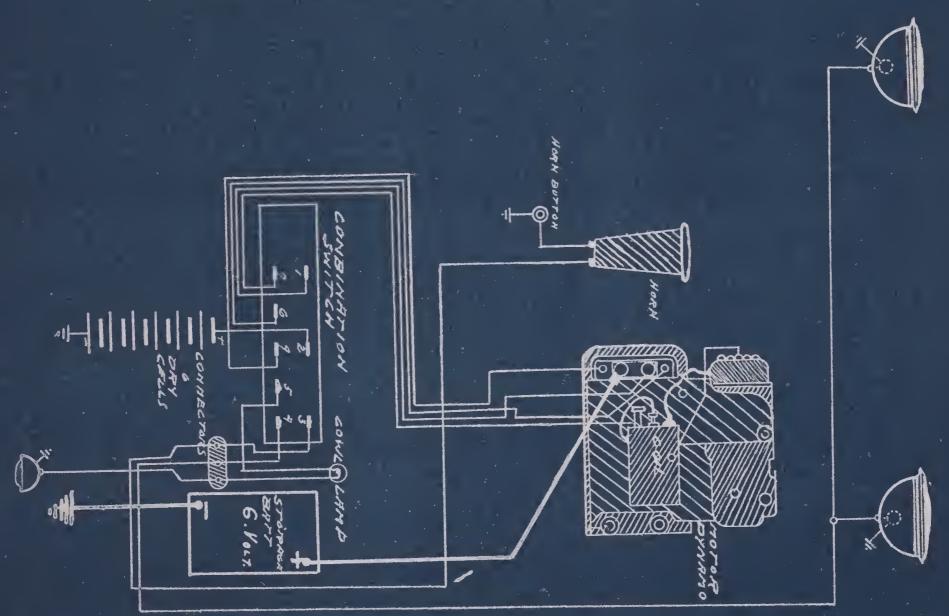




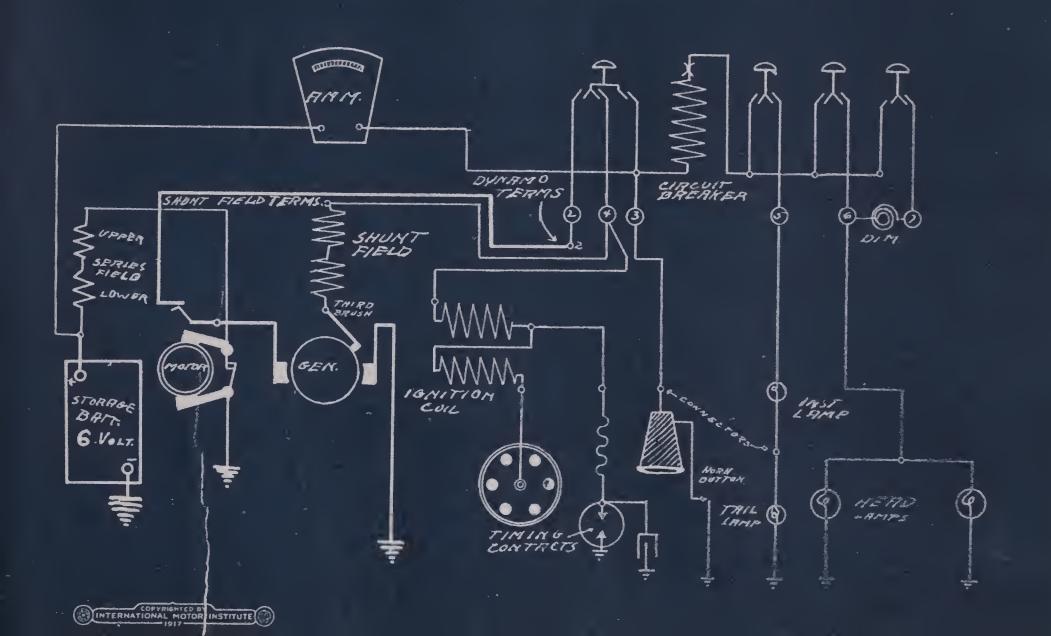




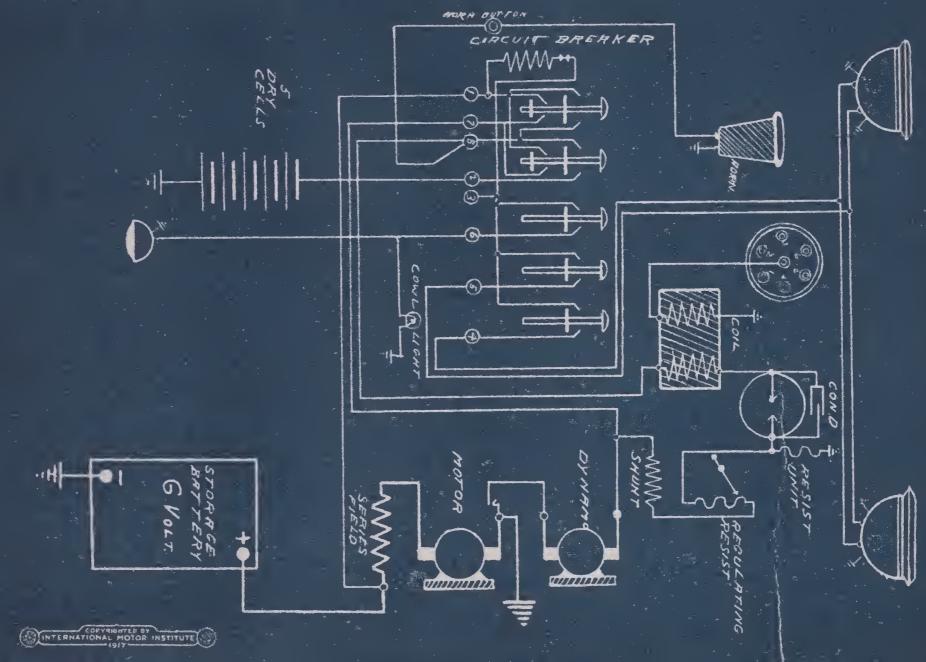


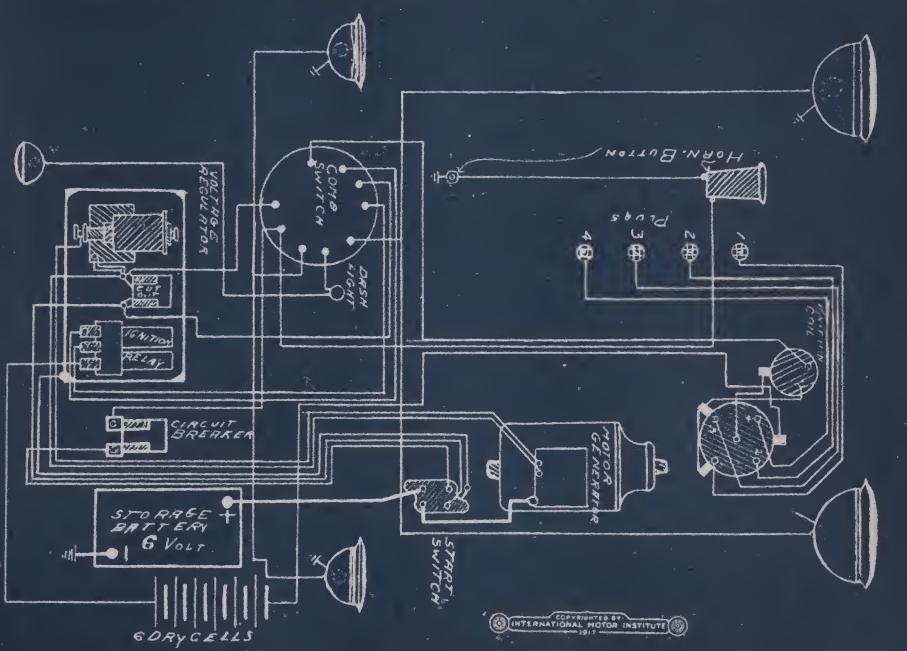


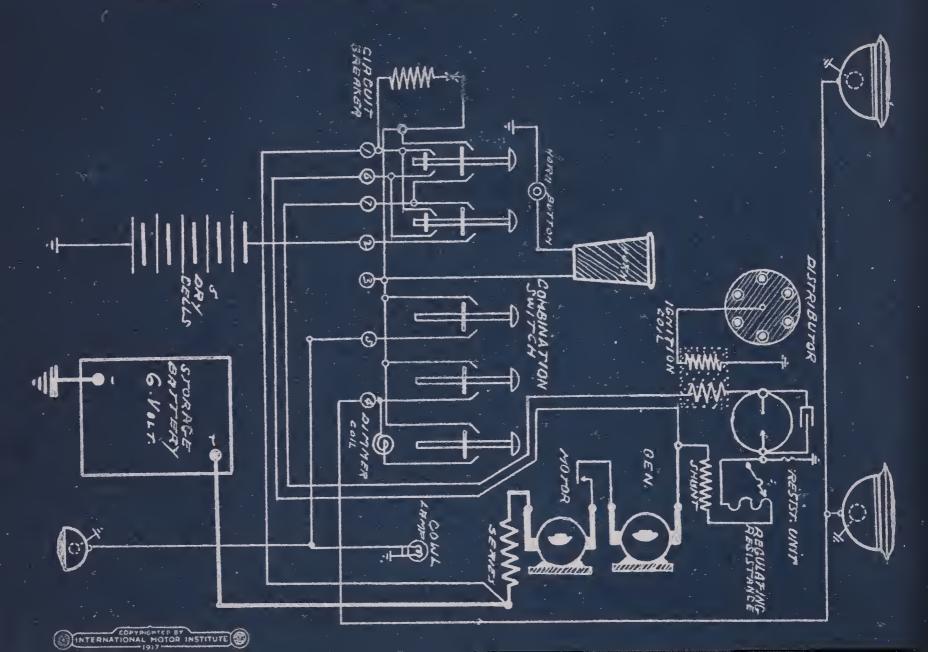
DELCO HUDSON 1916 SUPER-SIX.



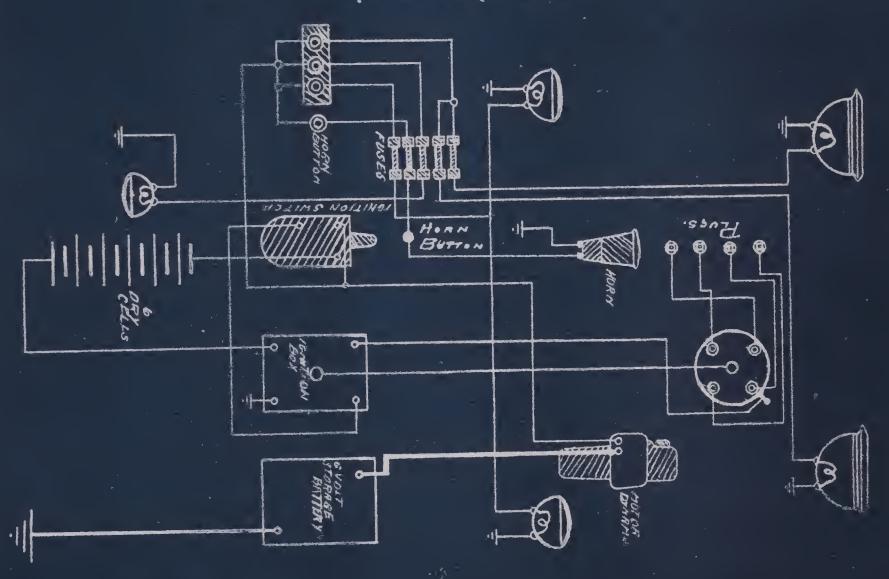
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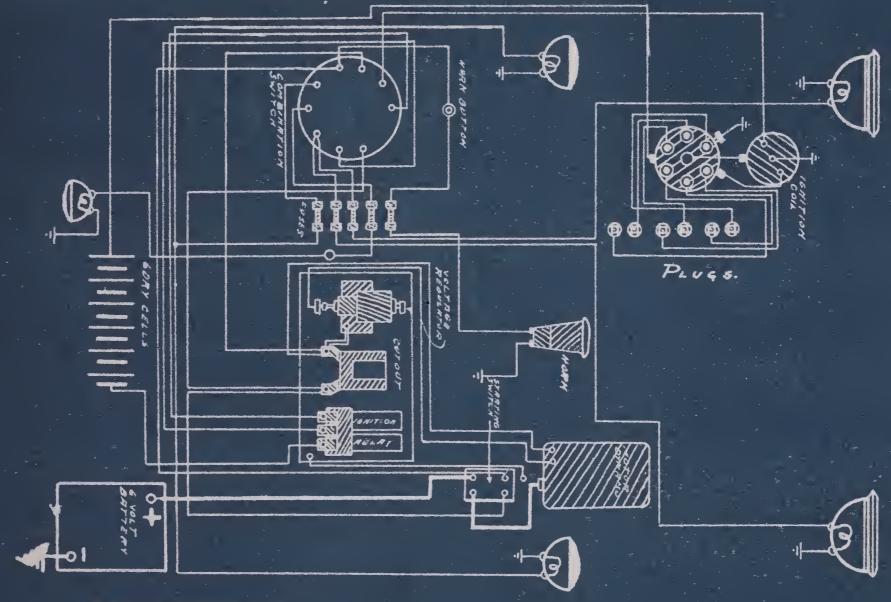


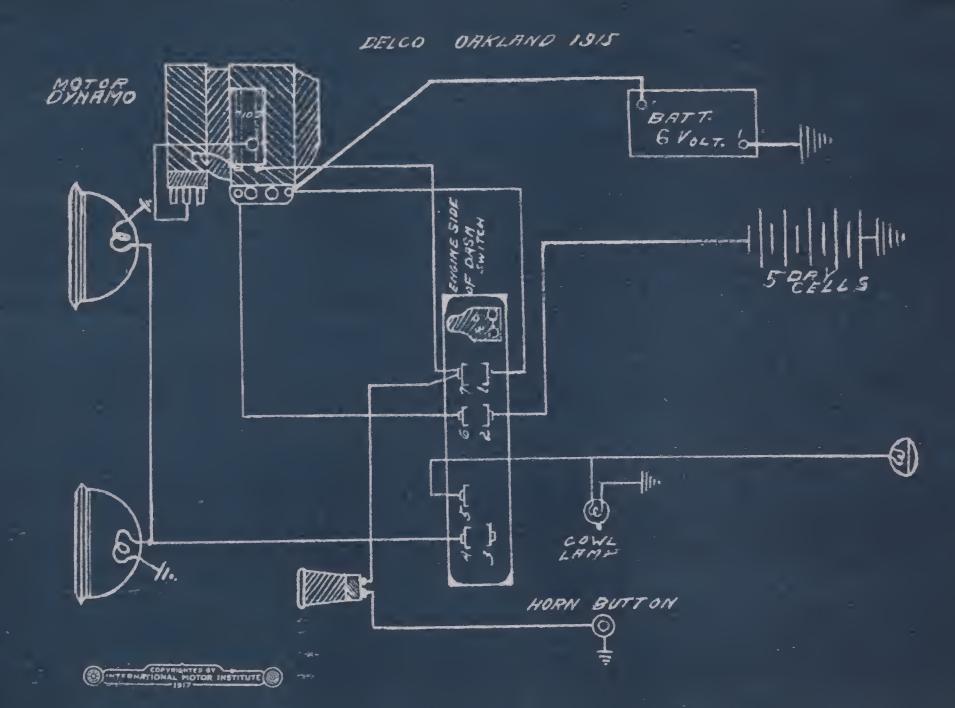


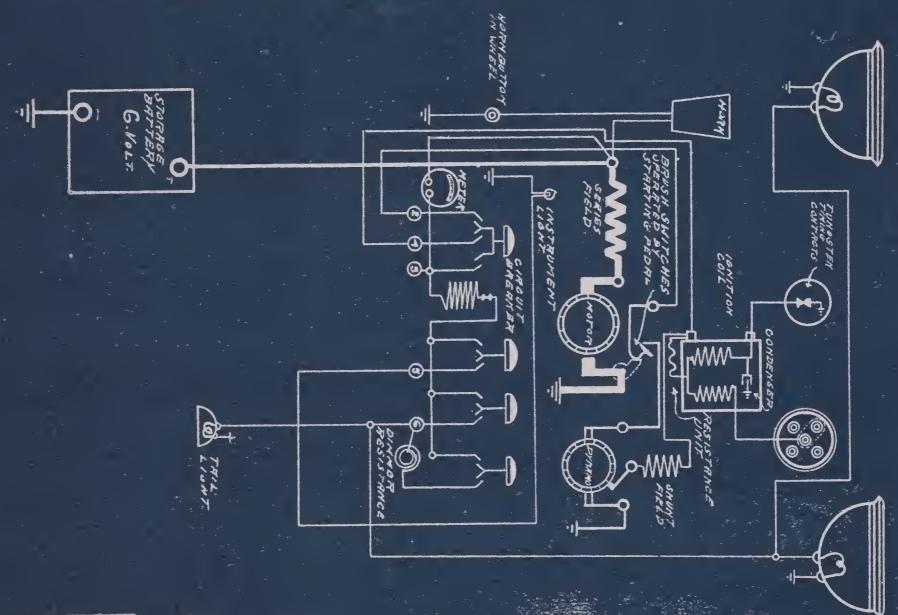
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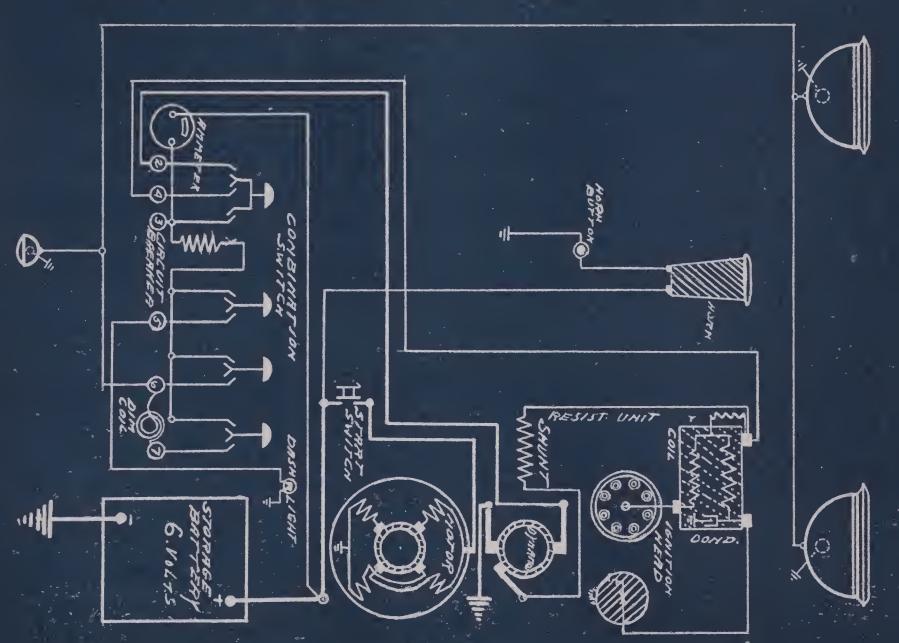






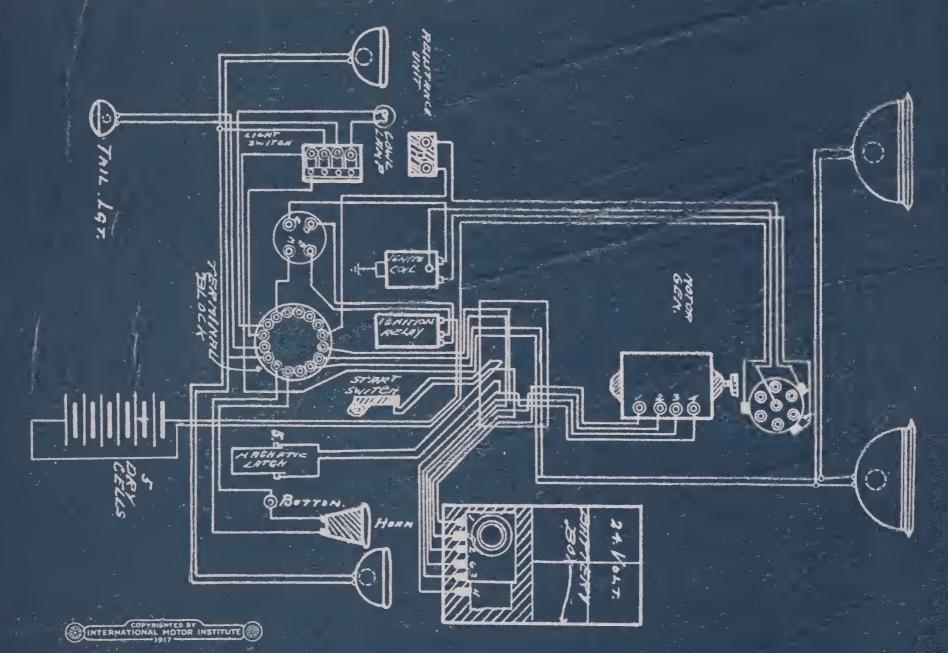


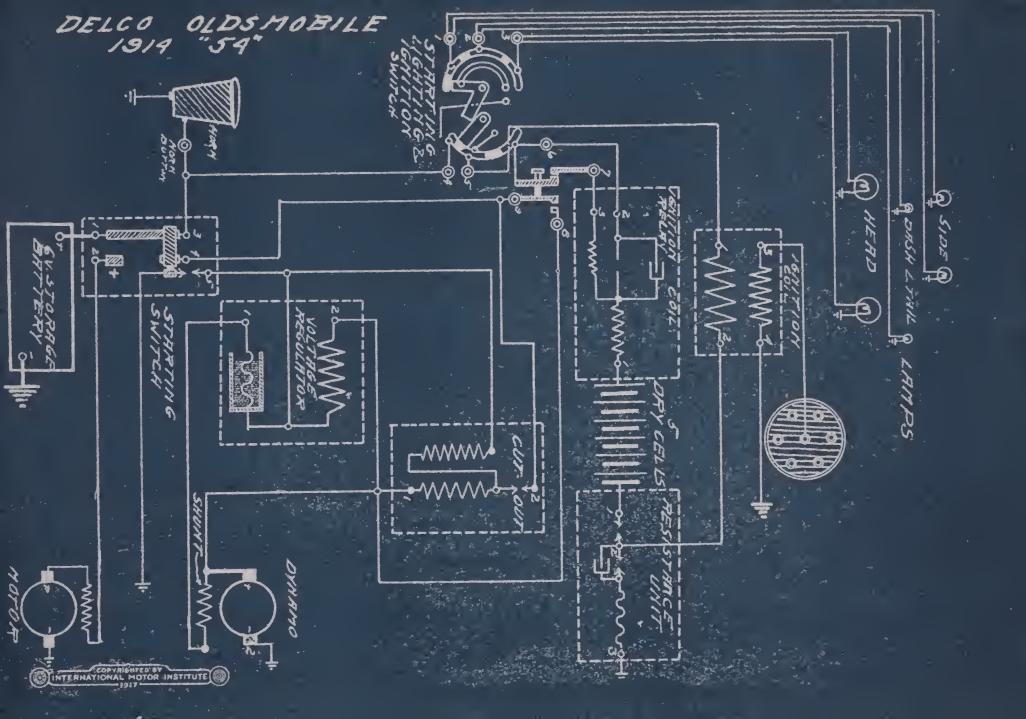


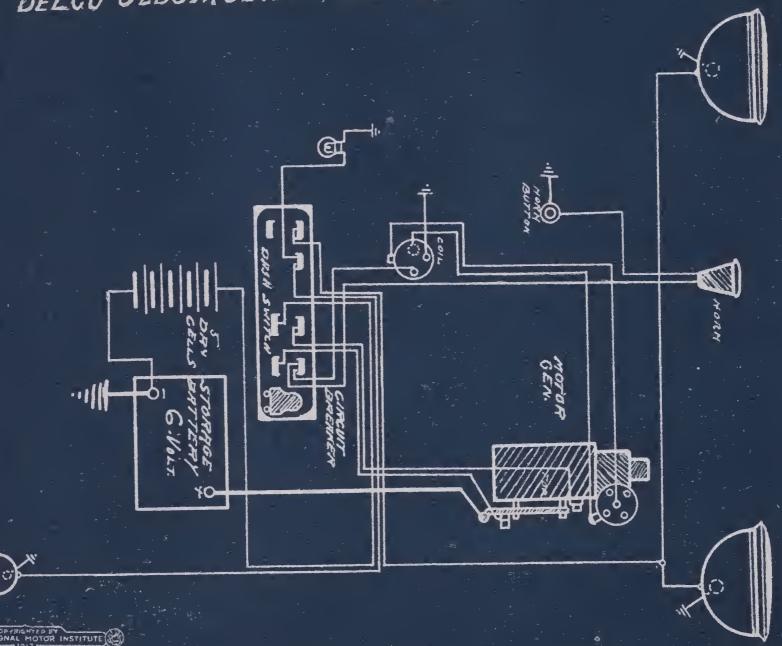




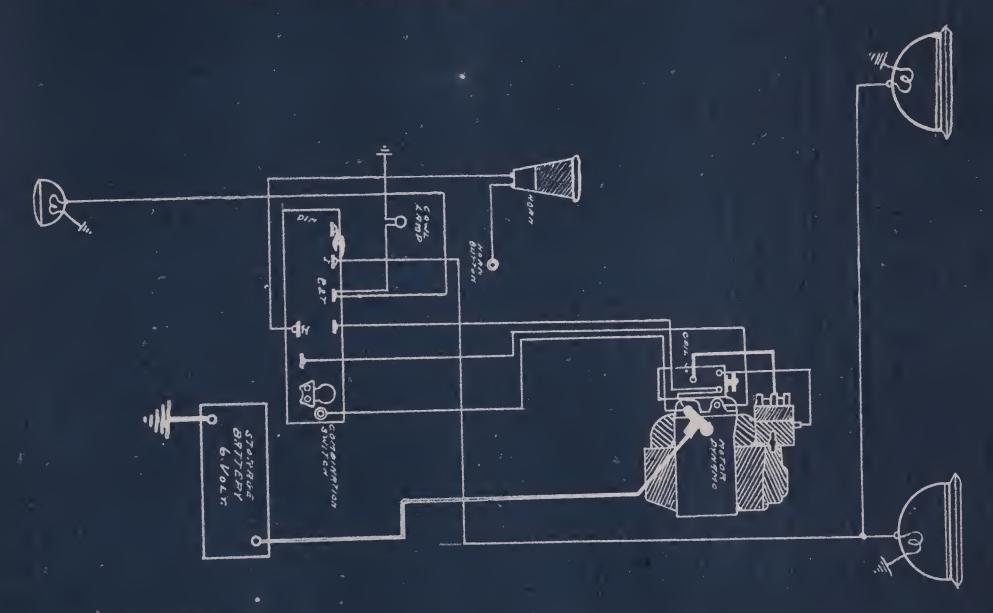
DELCO OLDSMOBILE 1918 "53"



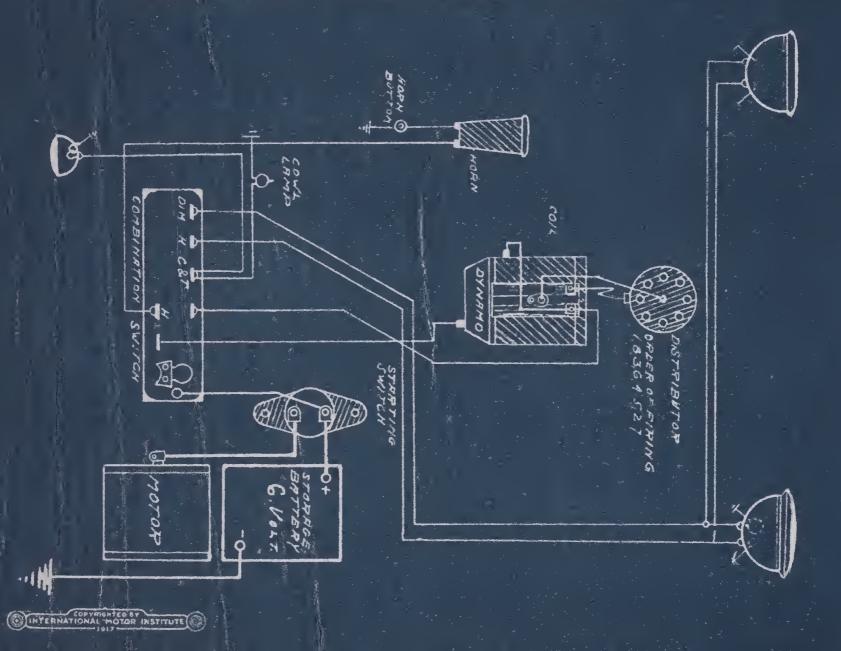


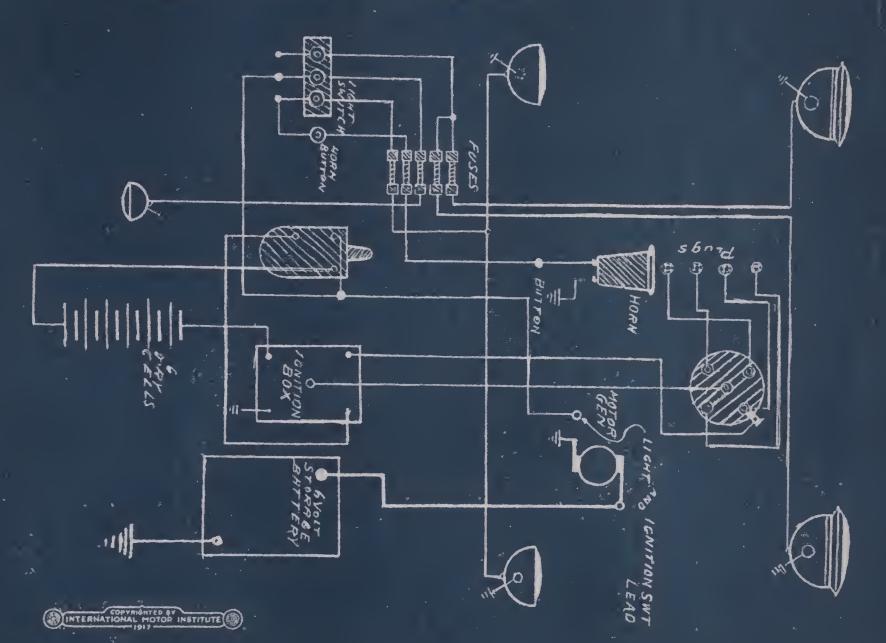


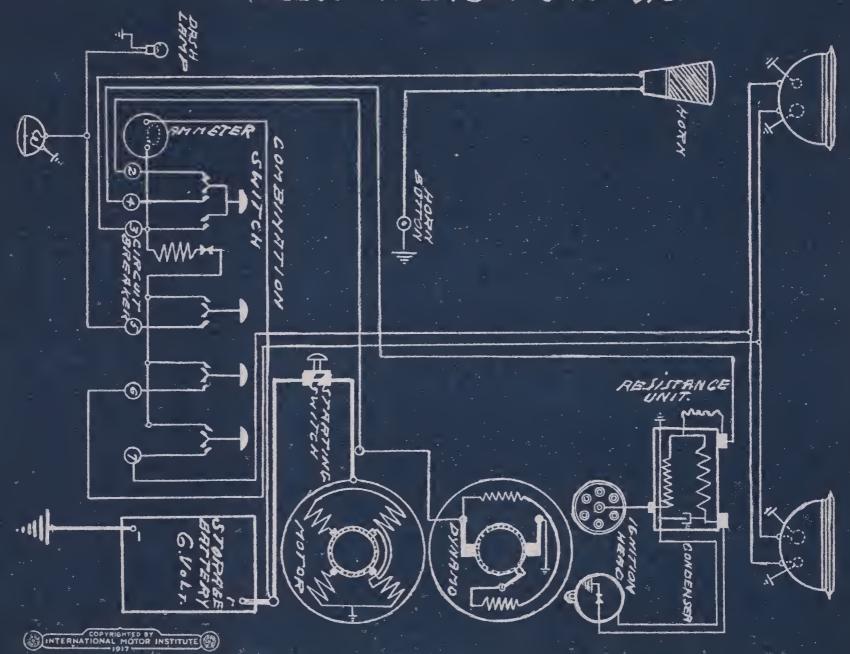
DELCO OLDSMOBILE 1916 4-43"



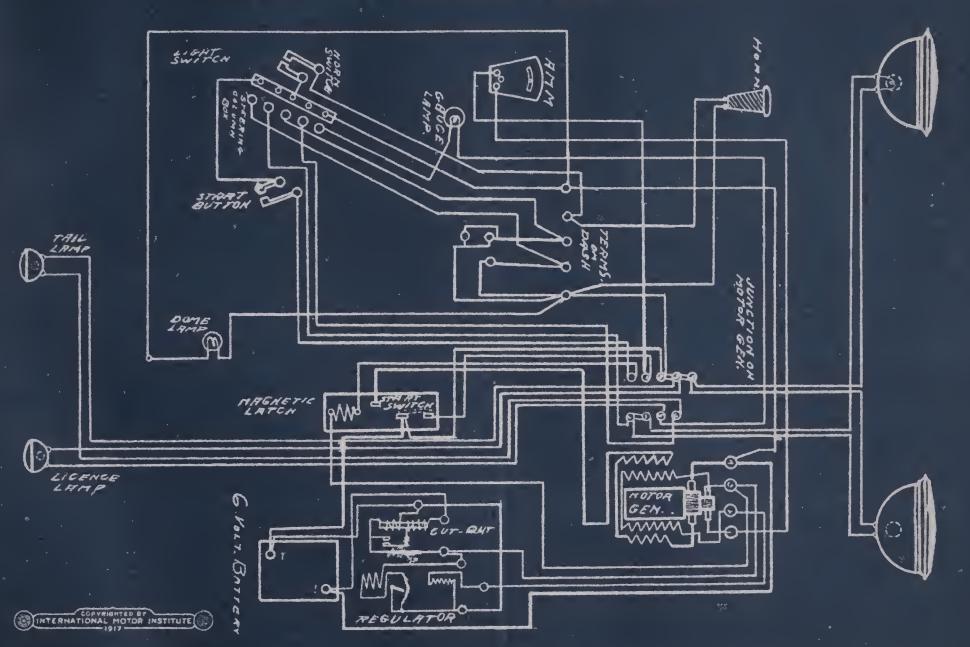




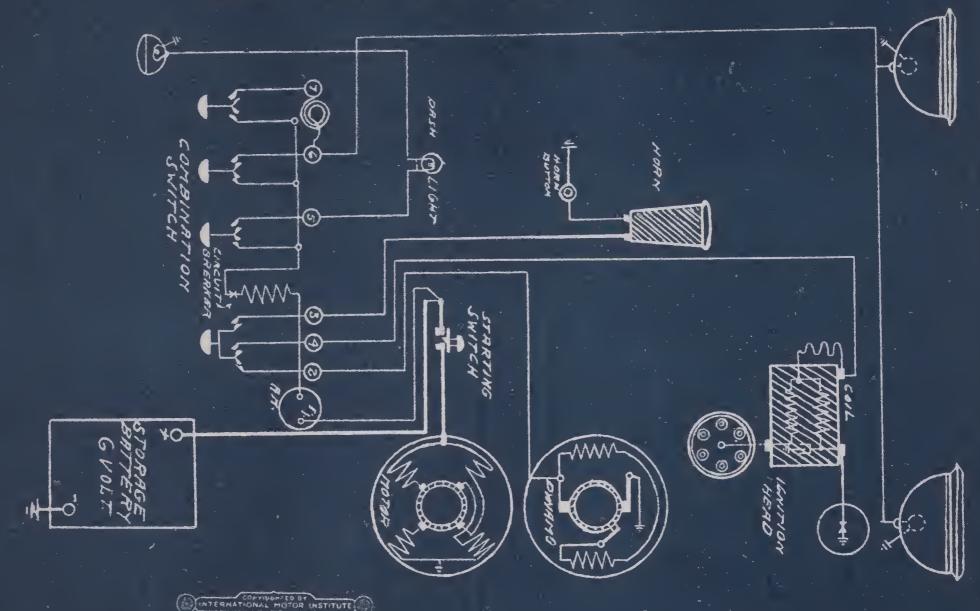


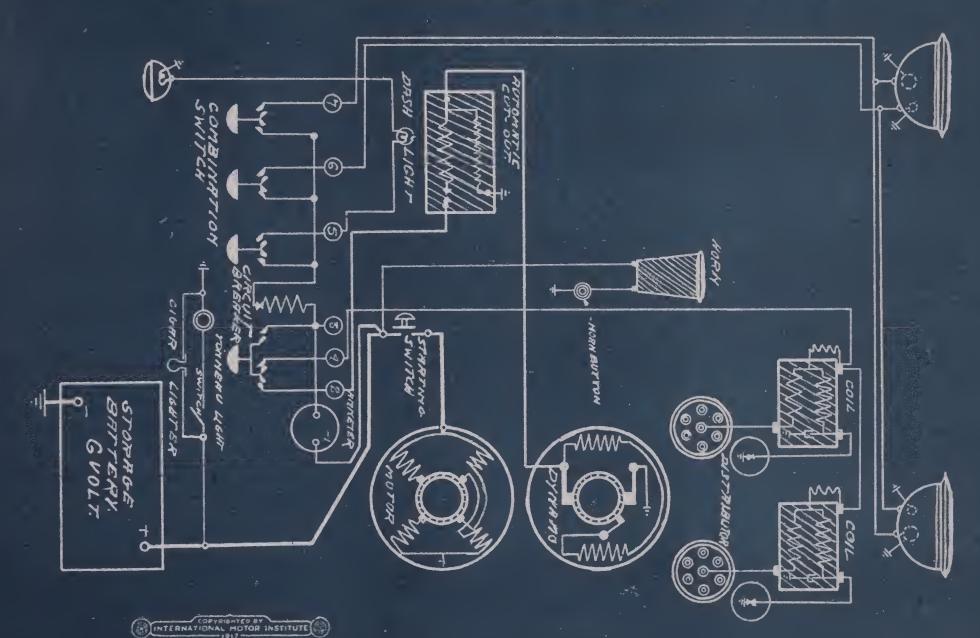


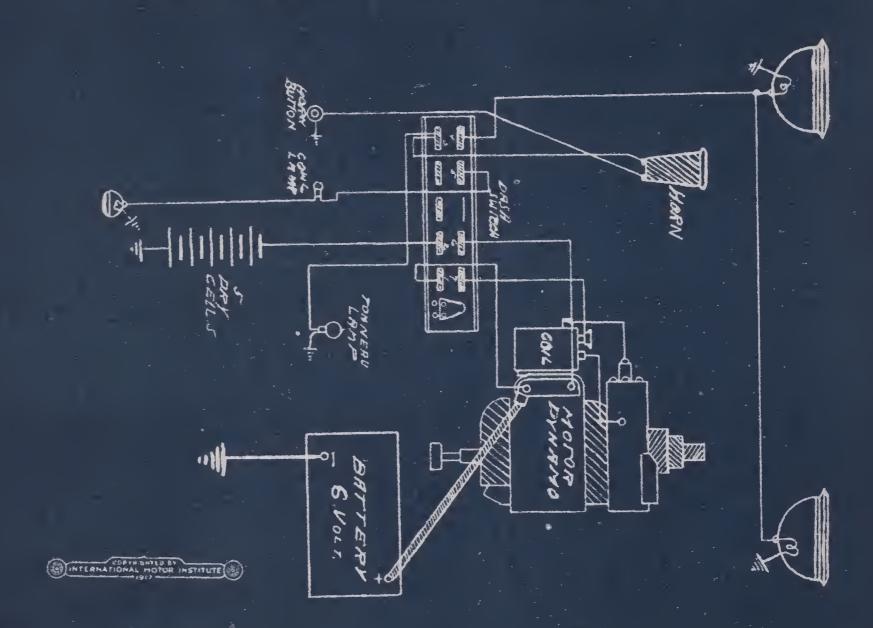
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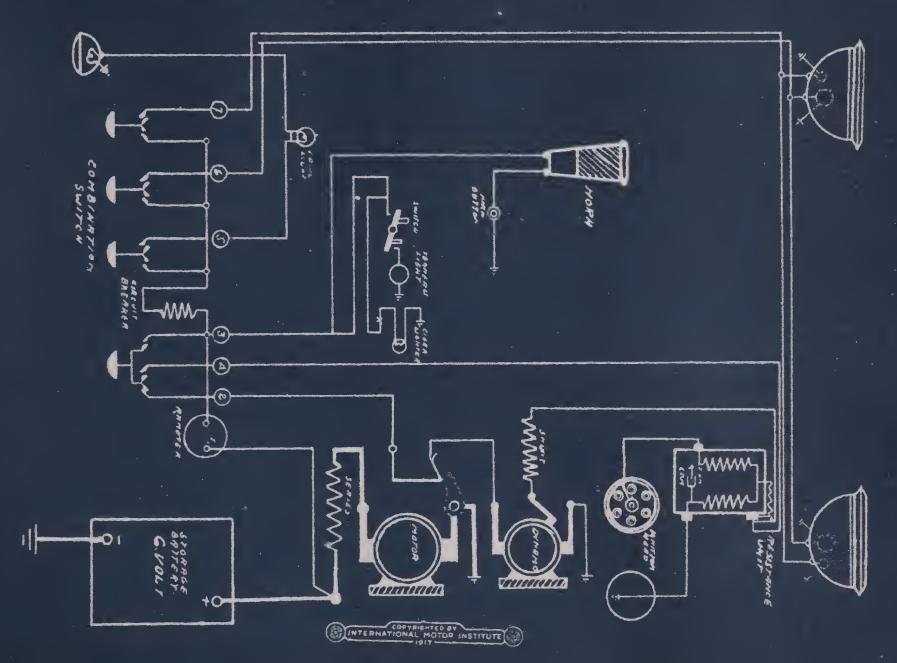


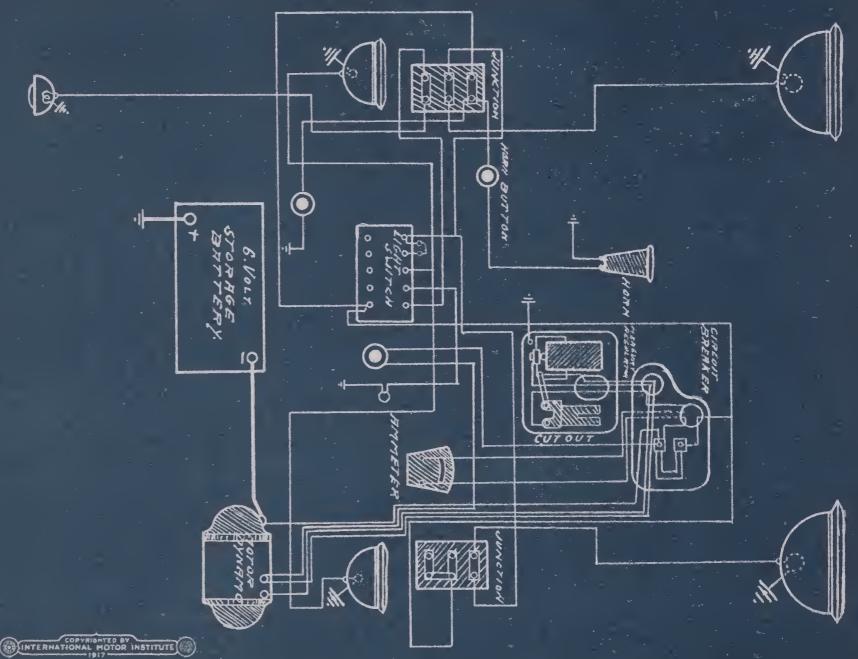
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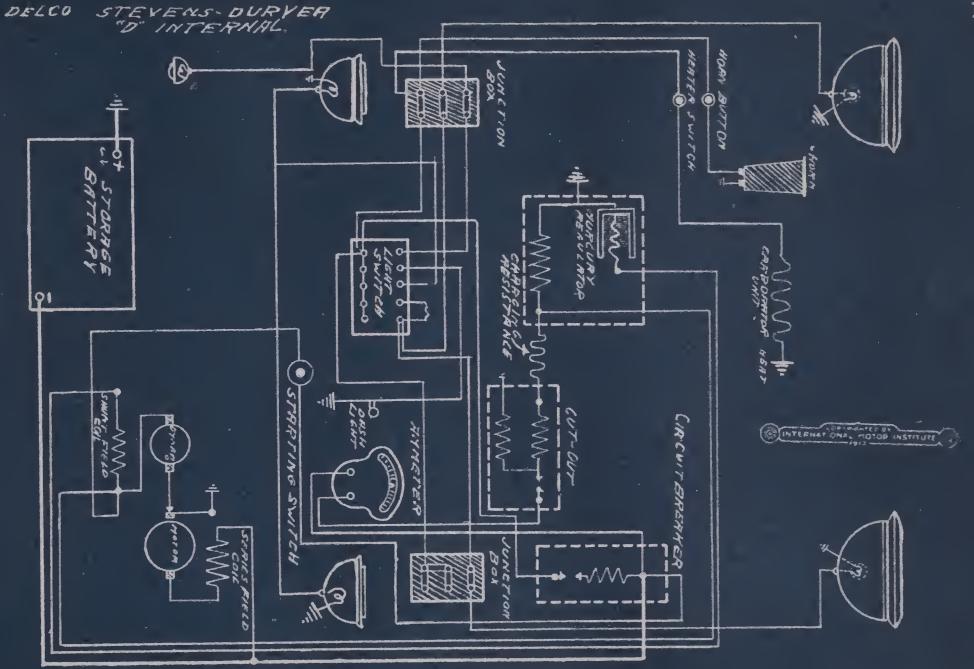


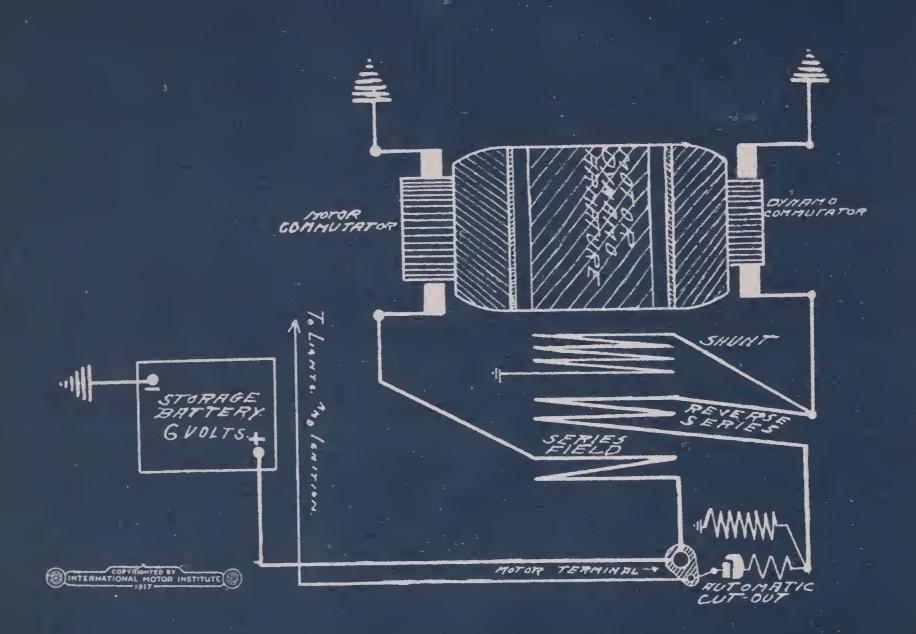




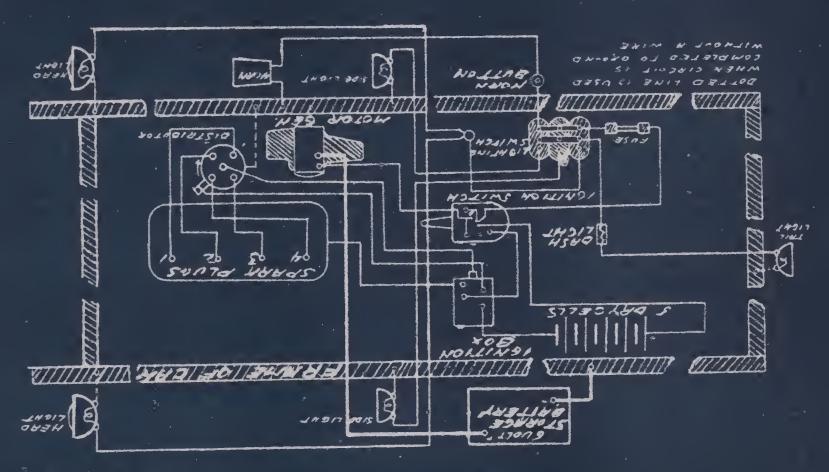


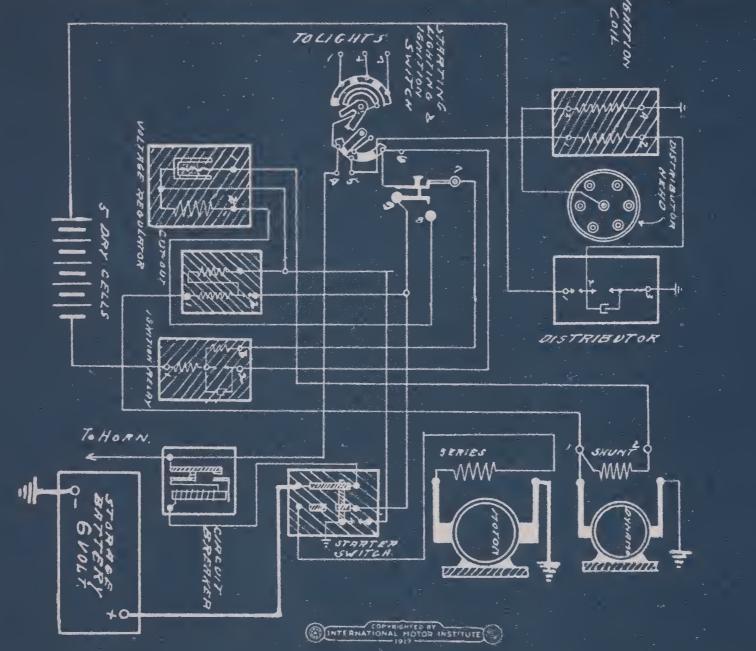


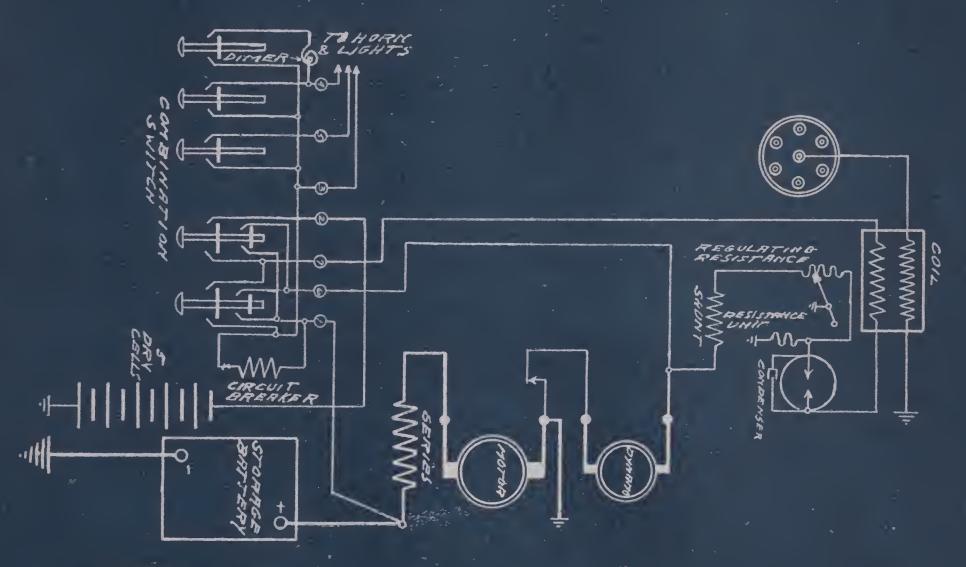




DELCO STANDARD WIRING 1914 DELCO JUNIOR

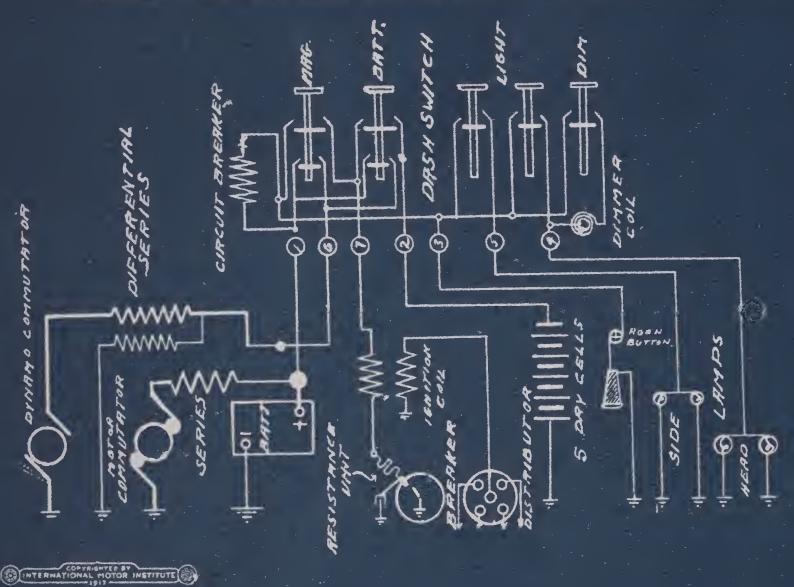




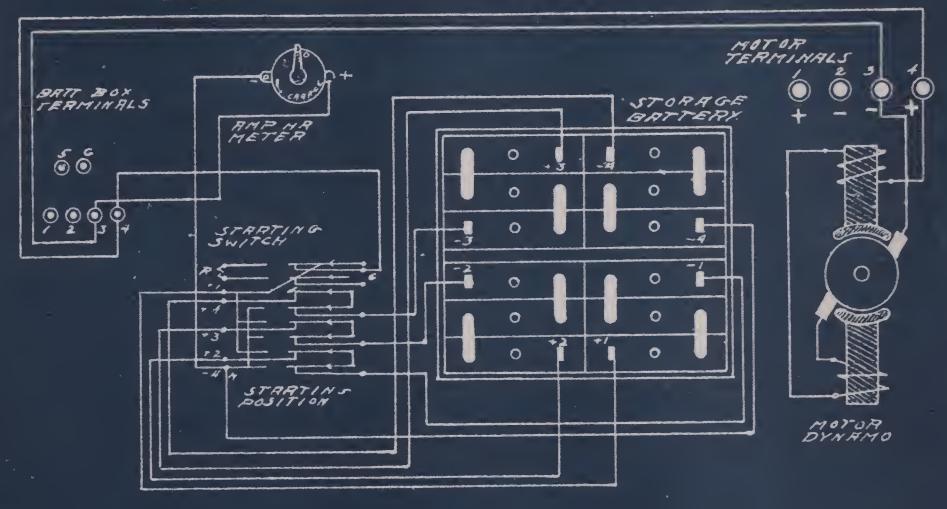




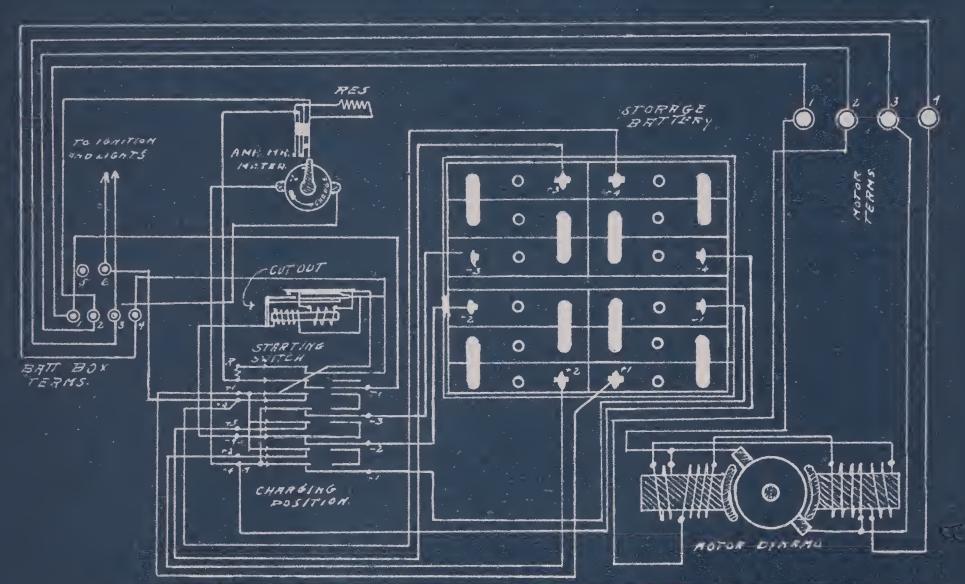
DELCO STANDARD WIRING 1915 REVERSE SERIES

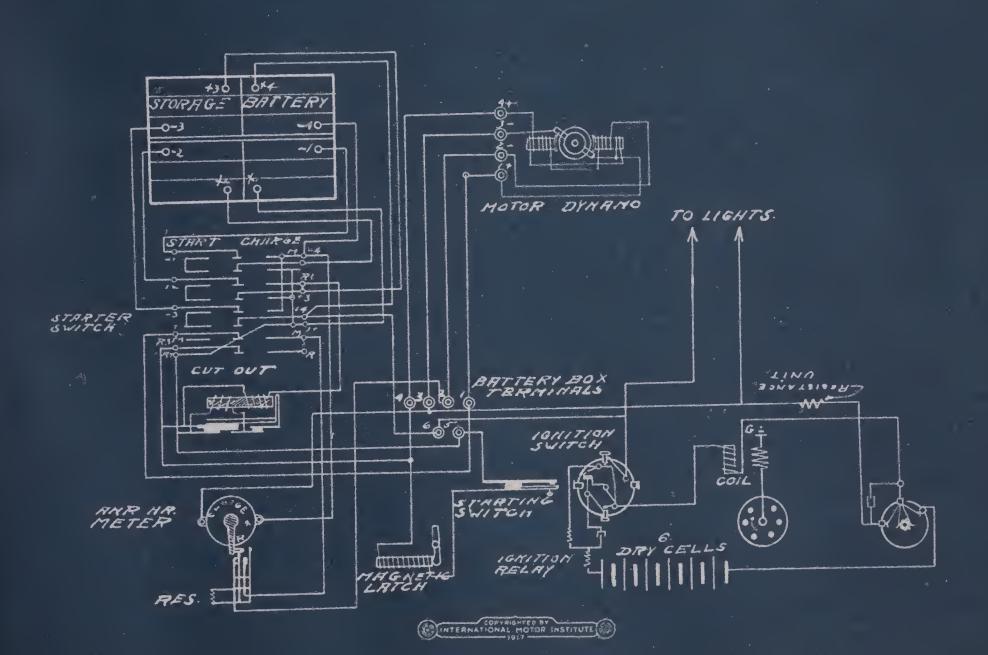


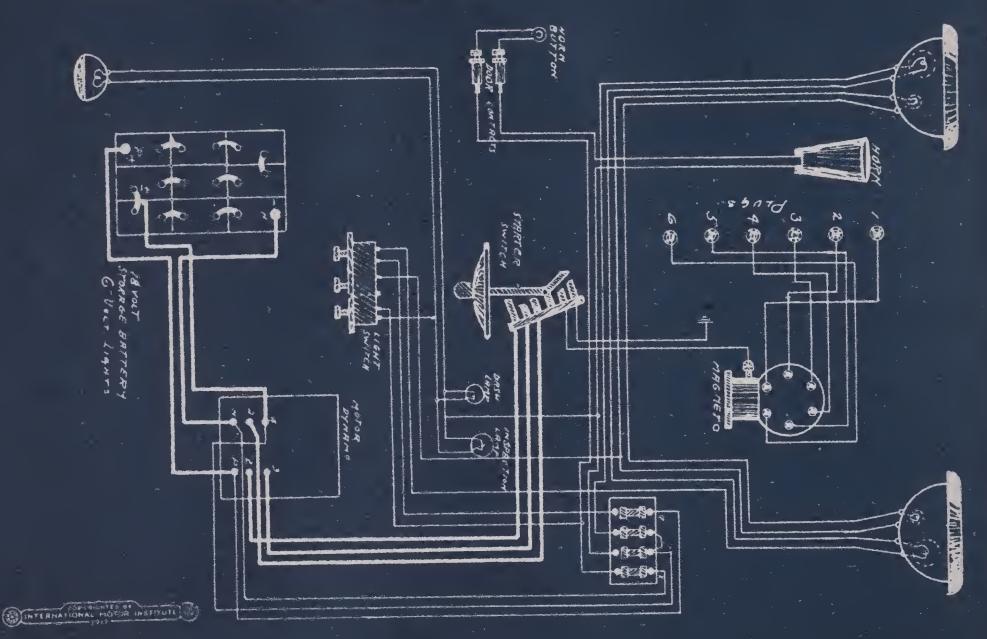
DELCO- STANDAPO WIRING 6-24 VOLT SYSTEM.

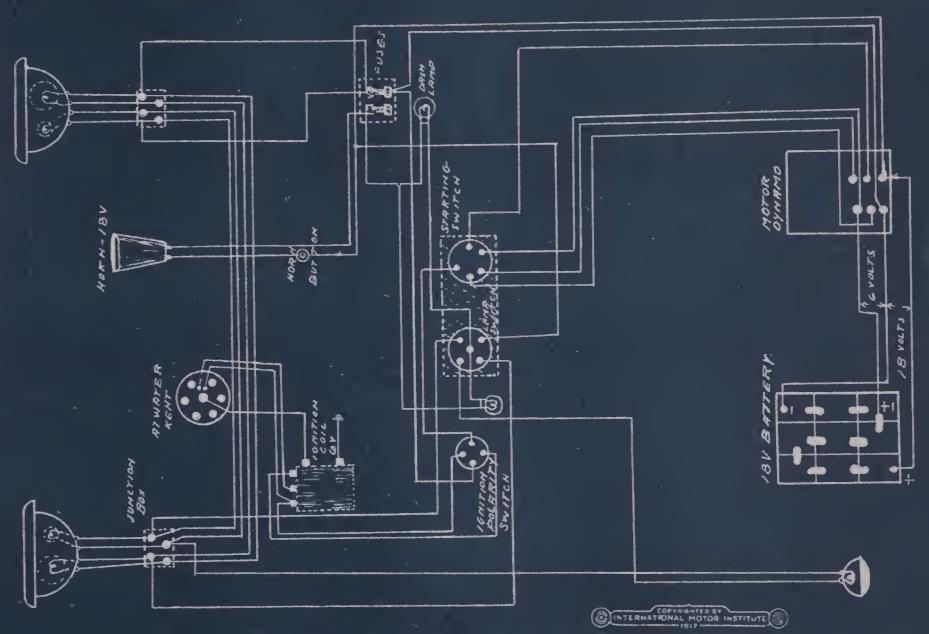


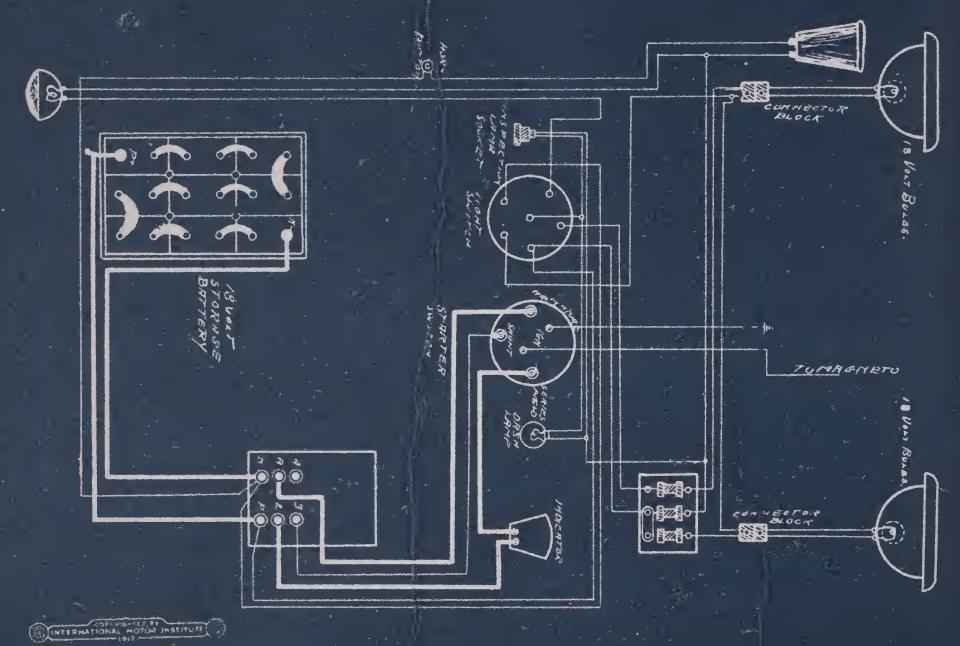


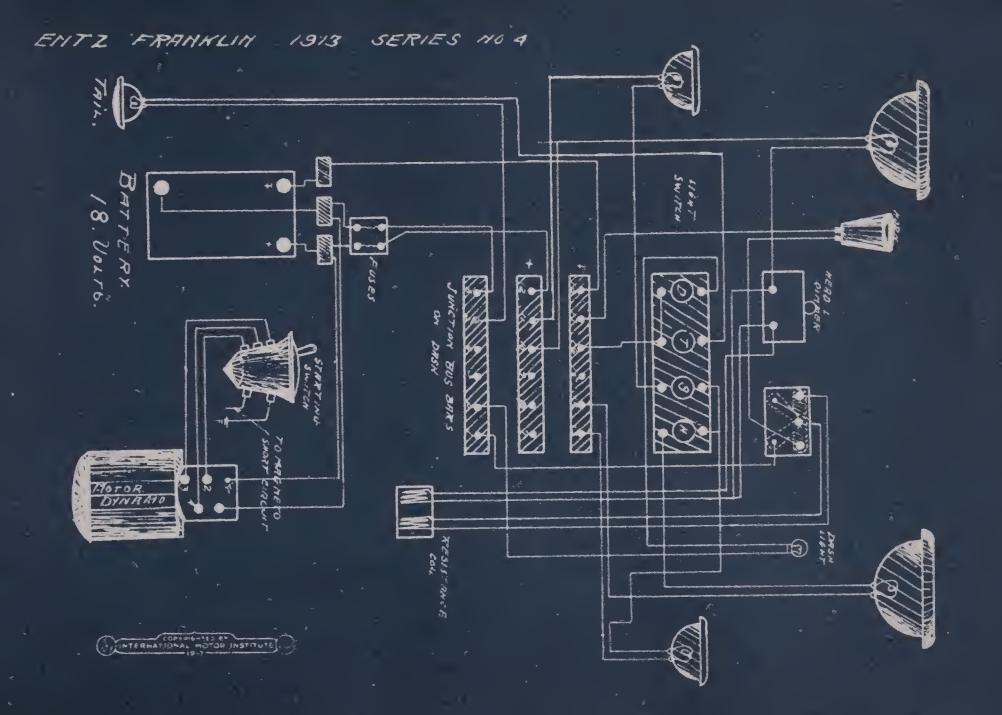


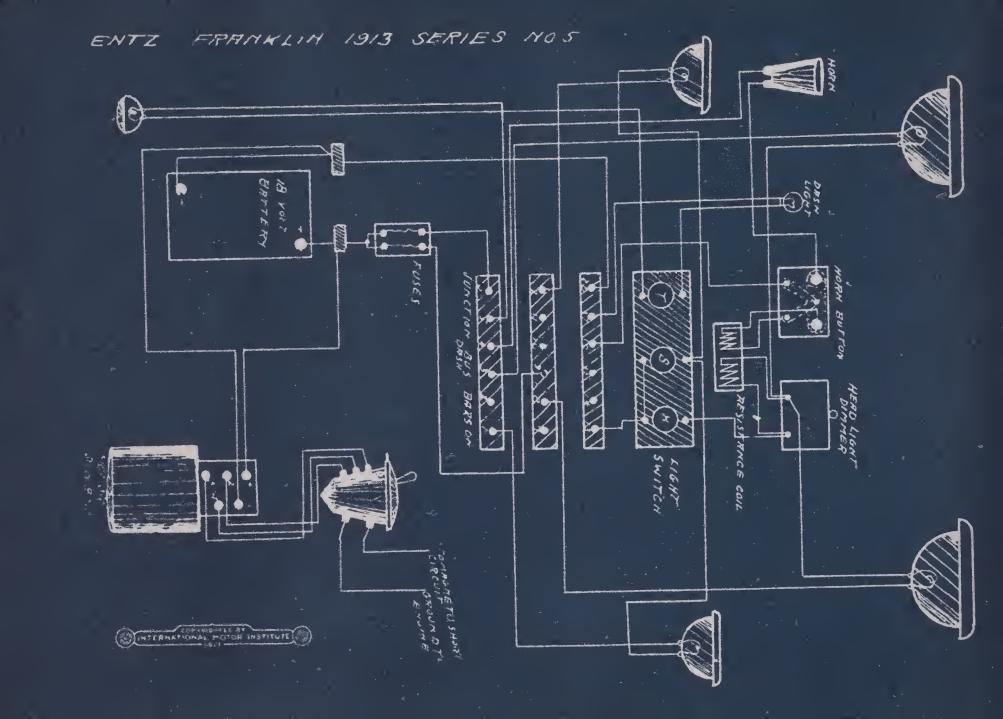


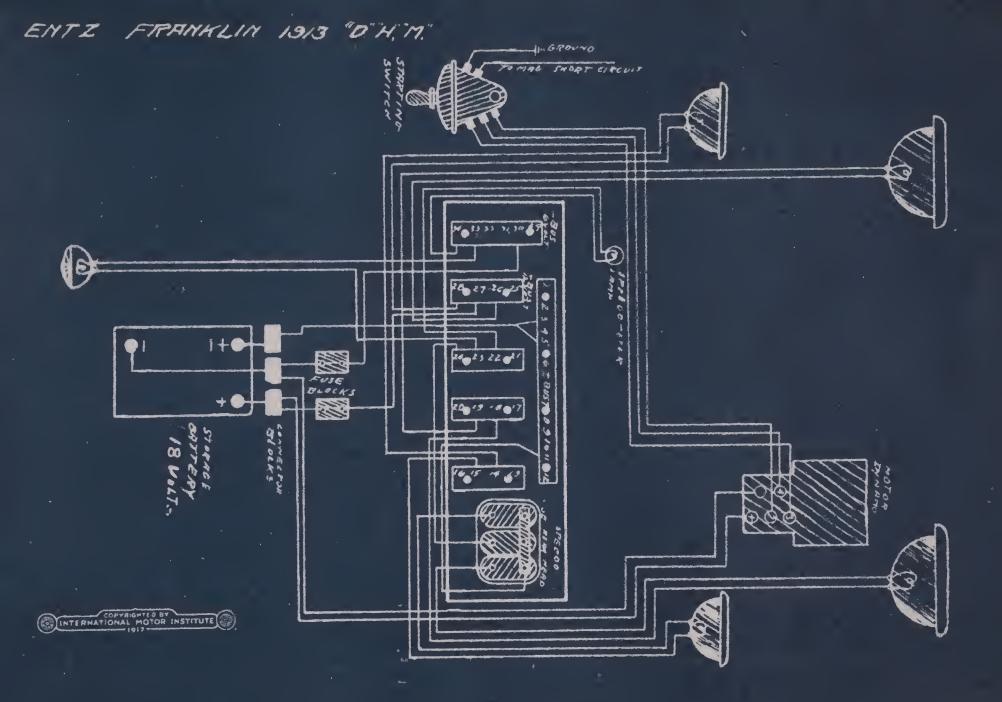


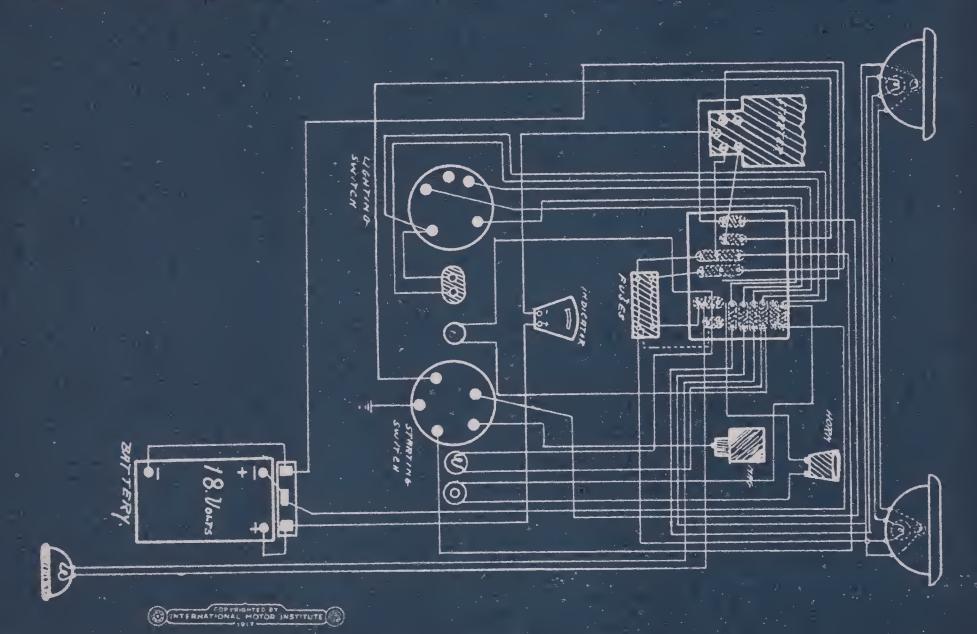


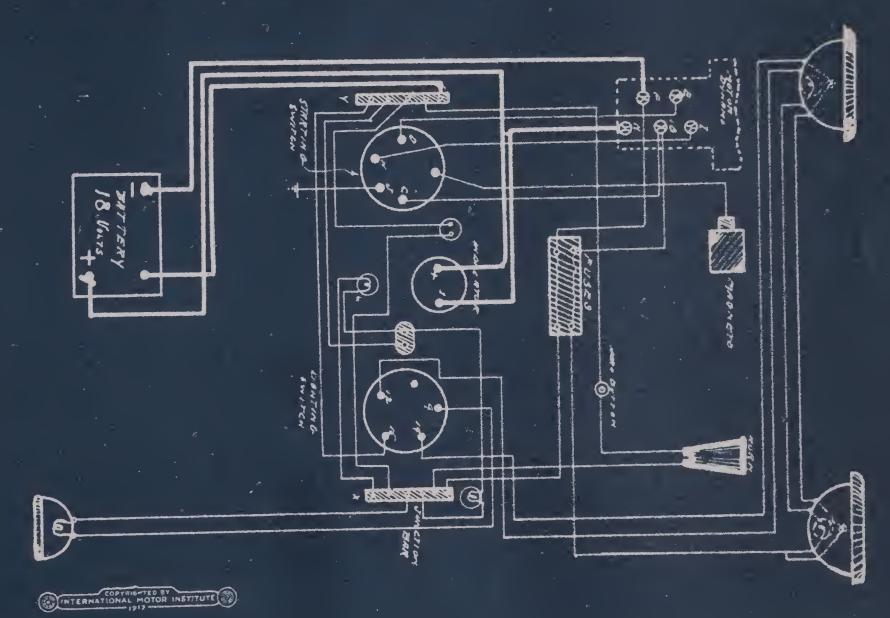


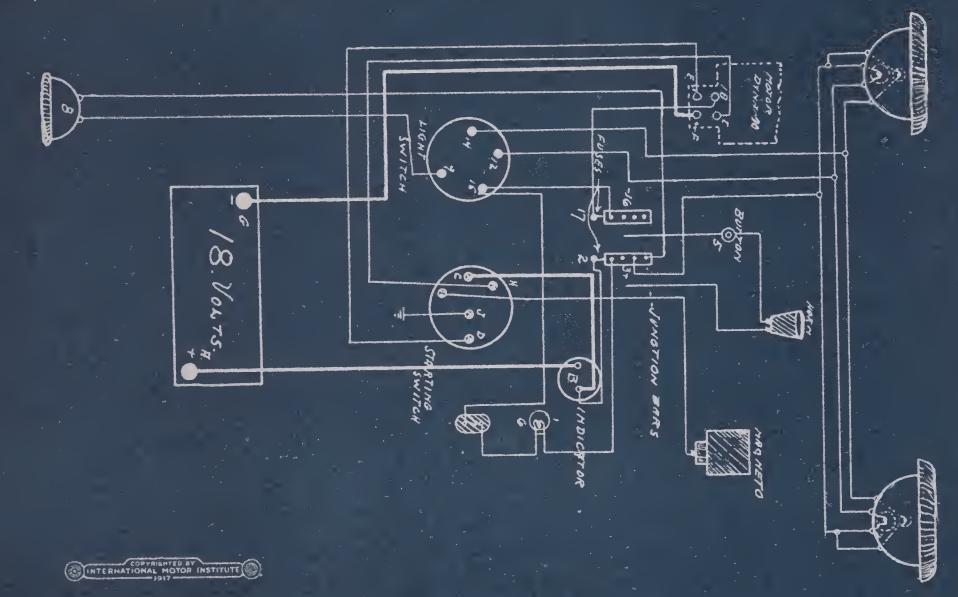


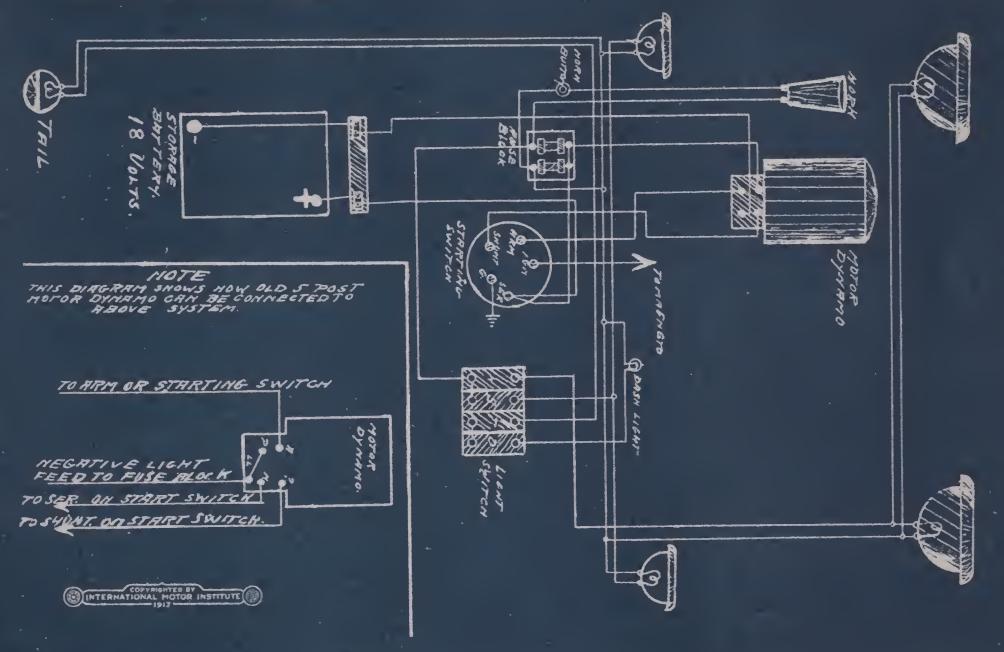


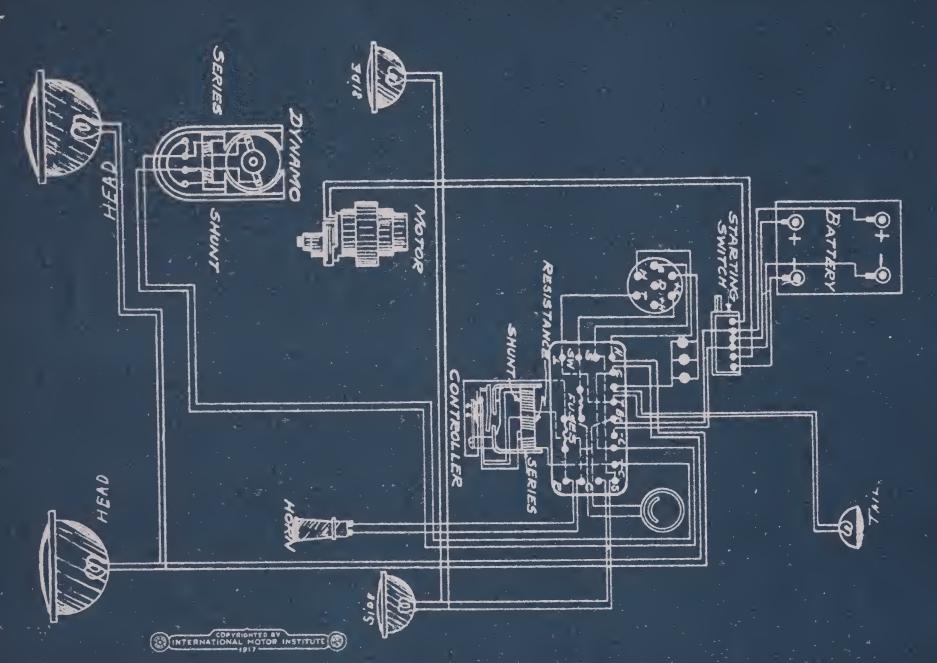




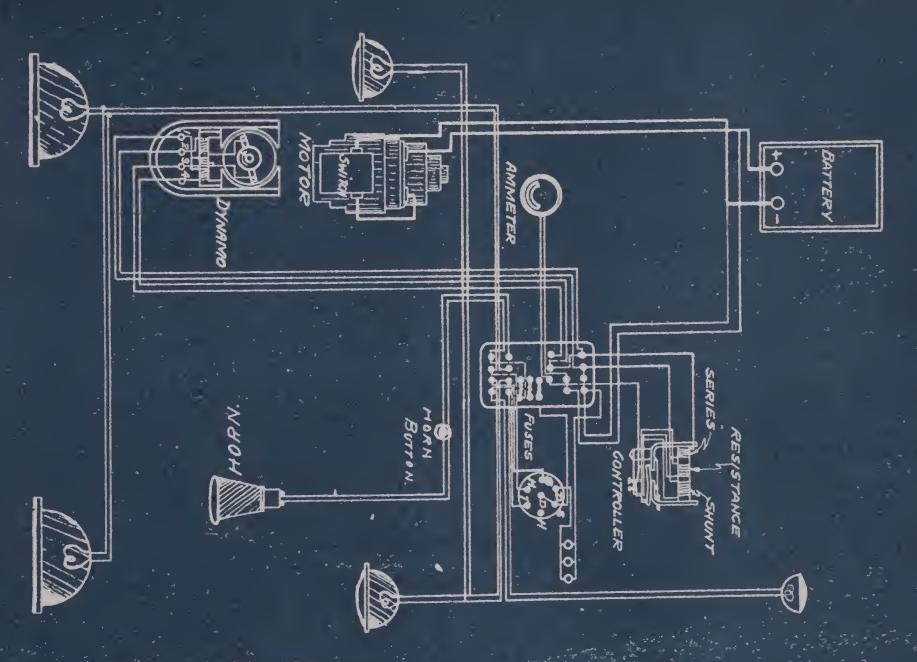






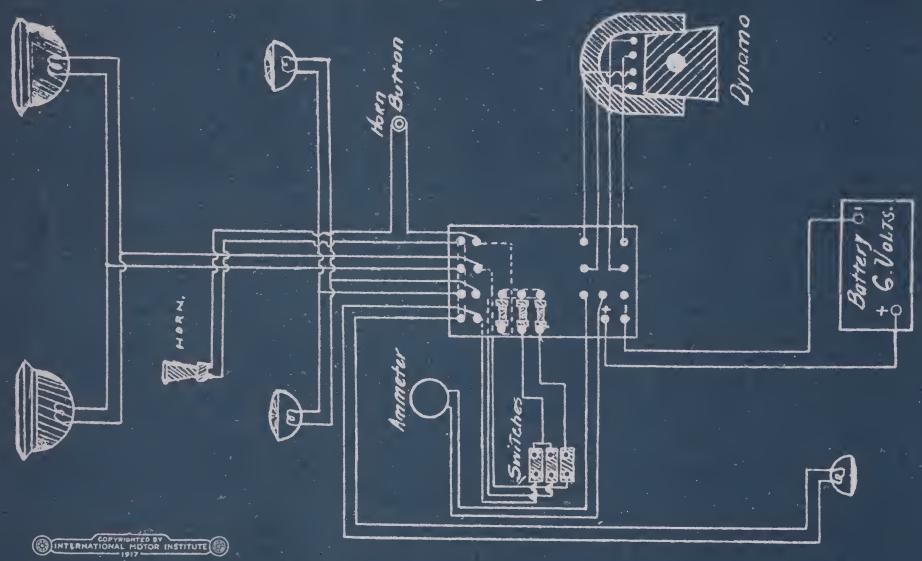


ESTERLINE KISSEL

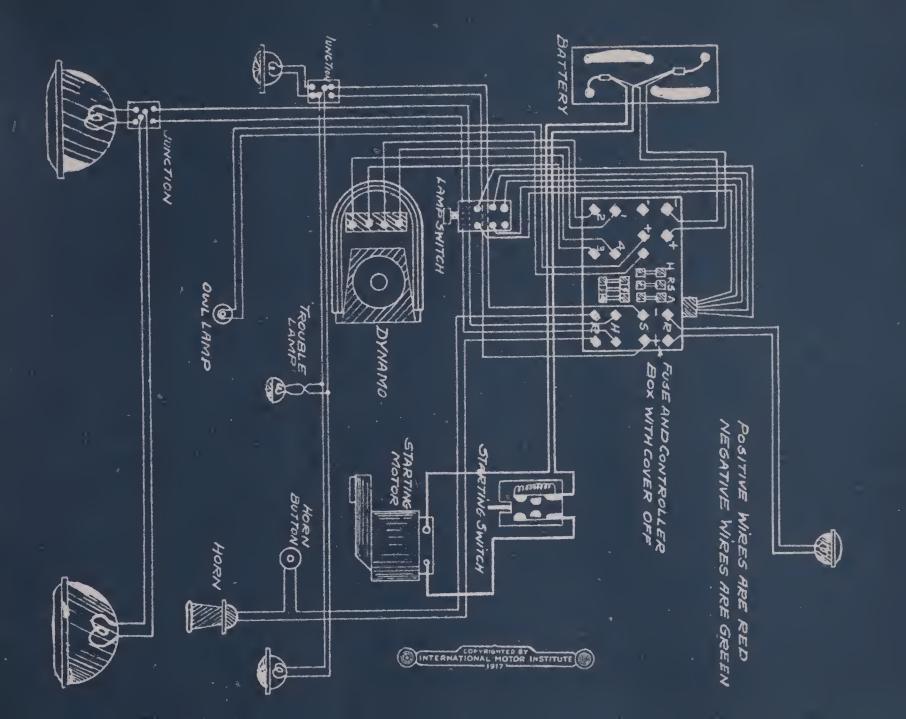


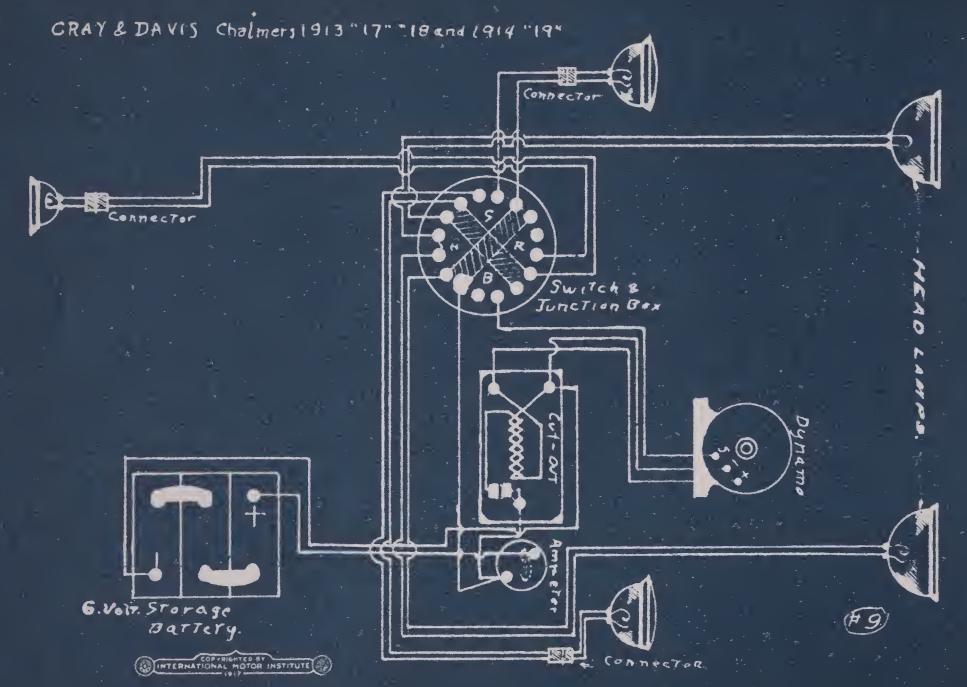
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ESTERLINE Standard Wiring 1912

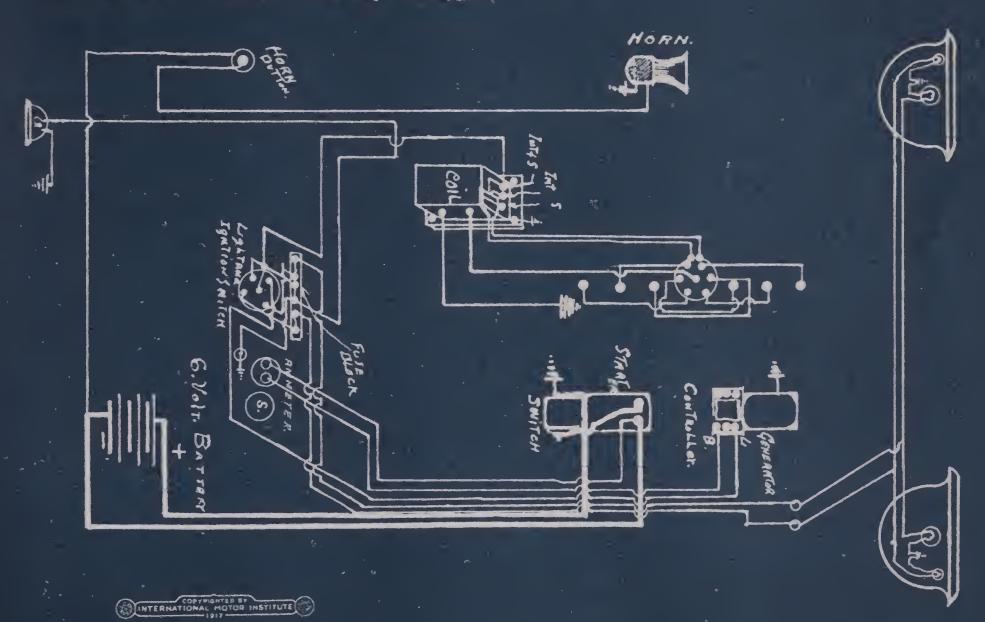


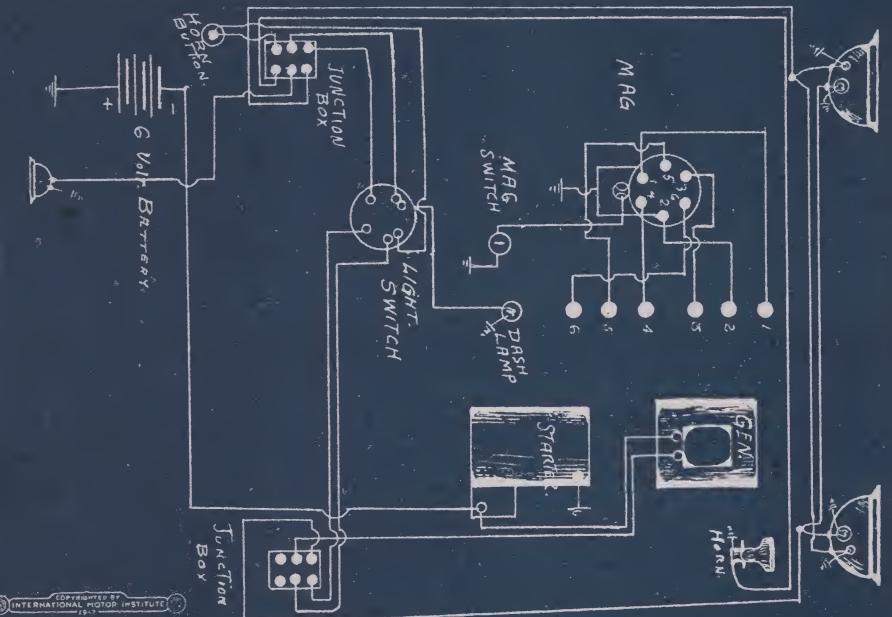
ESTERLINE - MITCHELL . 1913

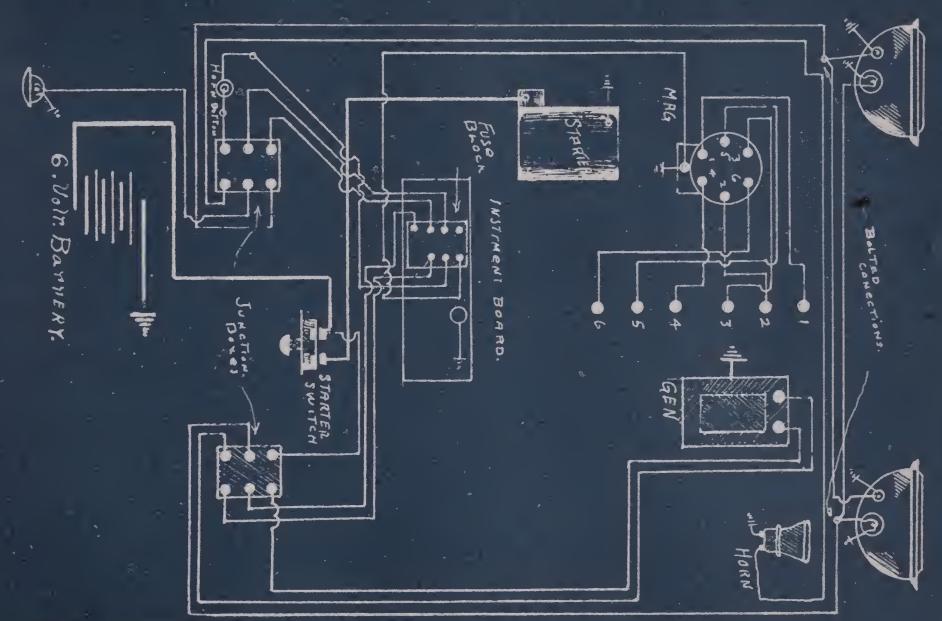


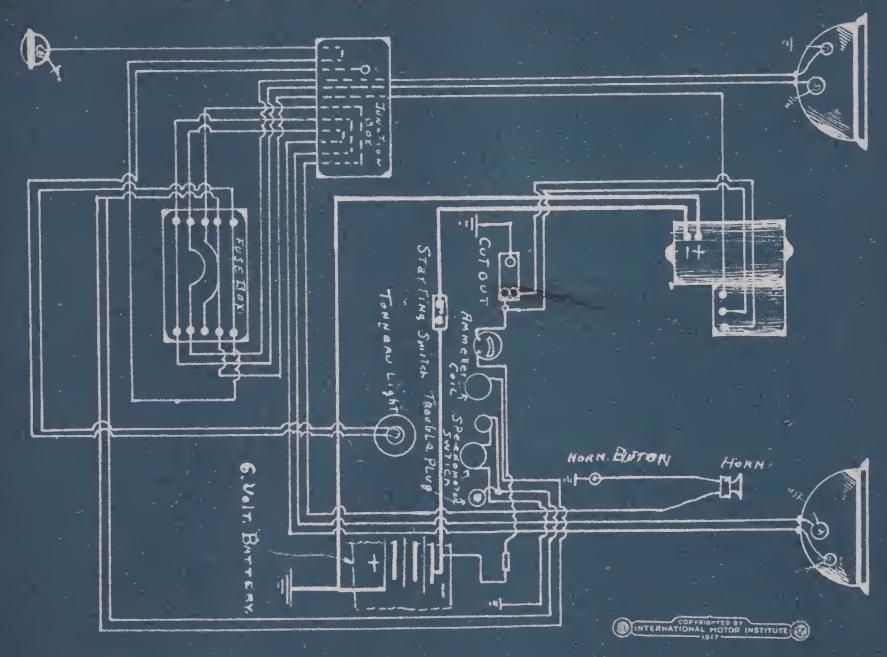


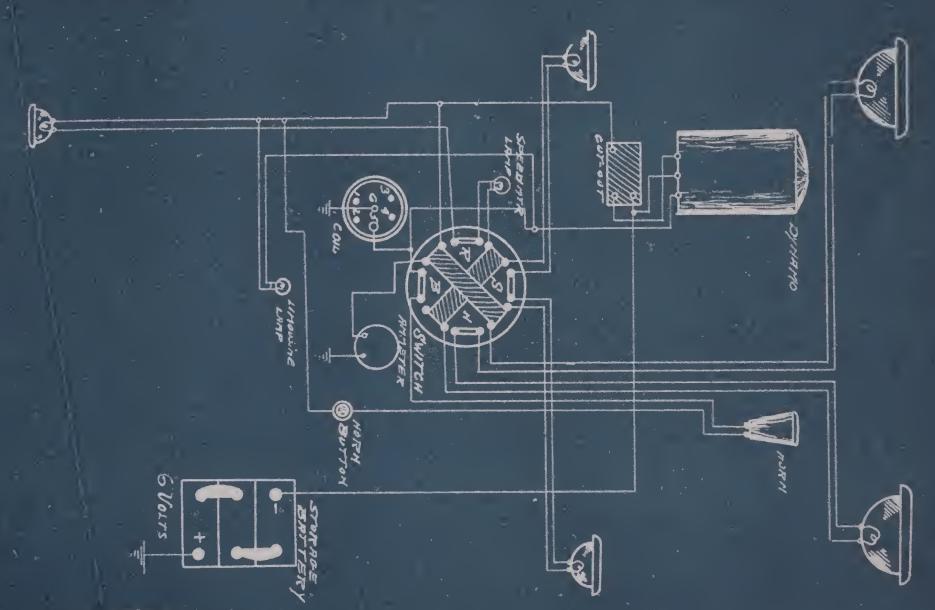
CRAY & DAVIS Chalmers 1916 "32" and "640"

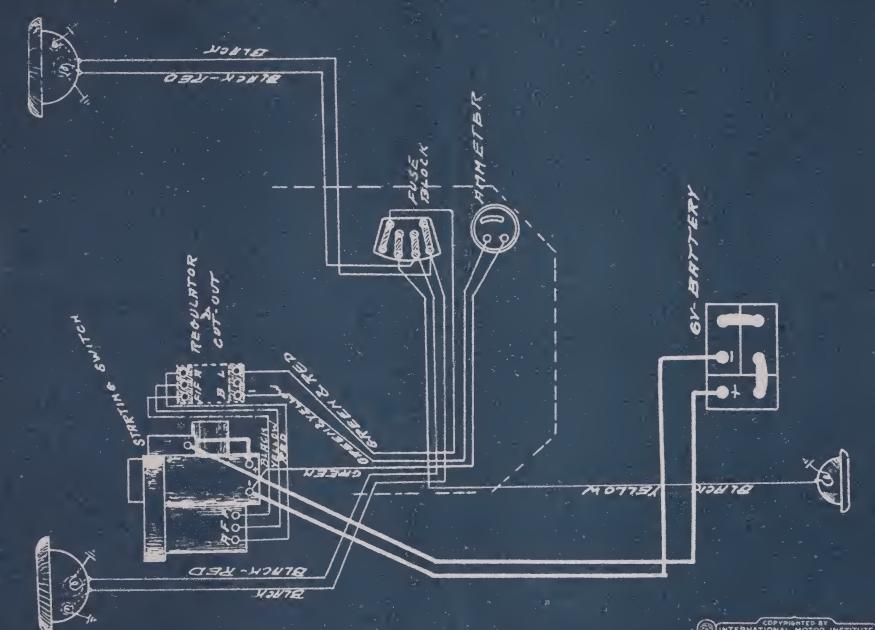


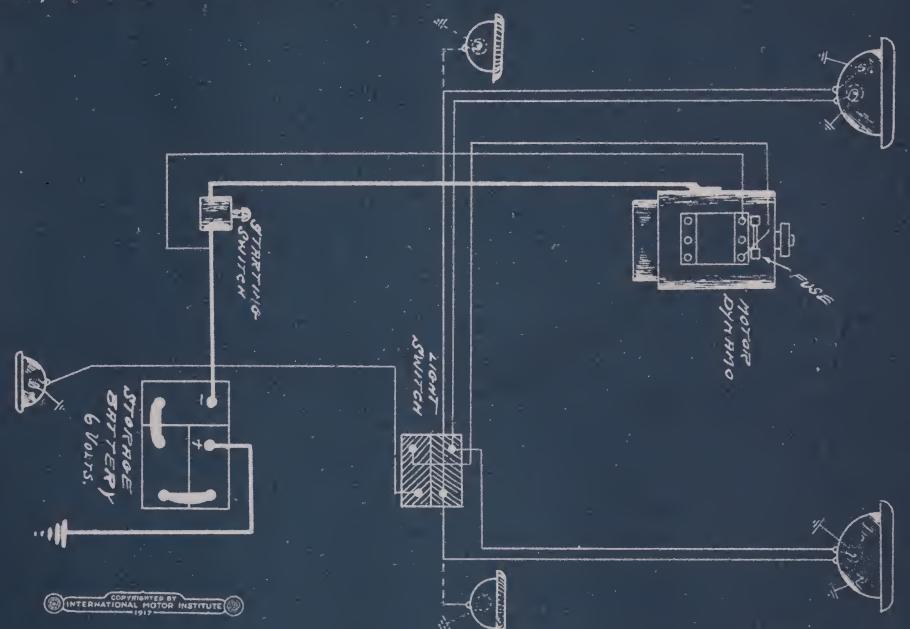


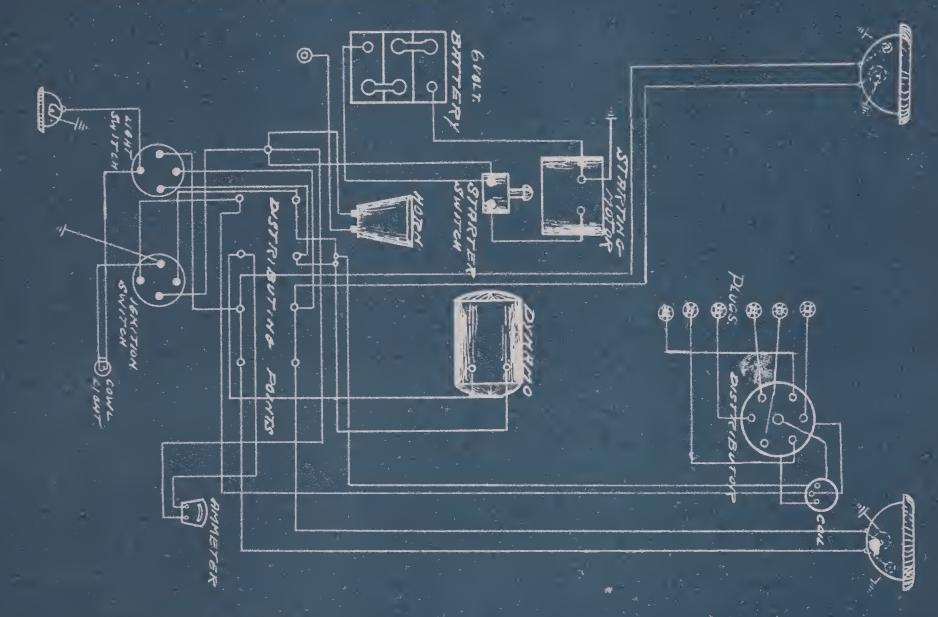


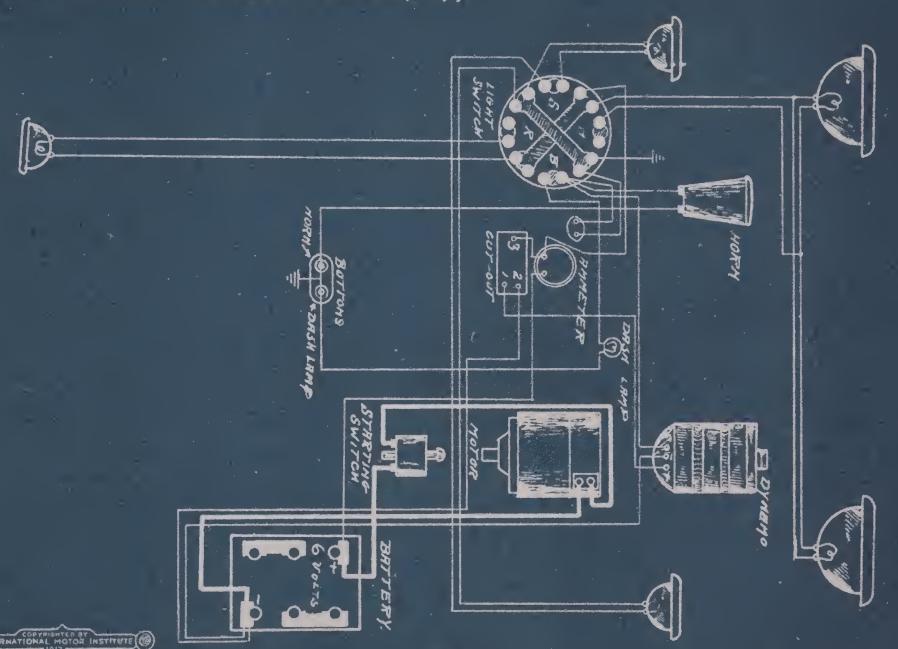


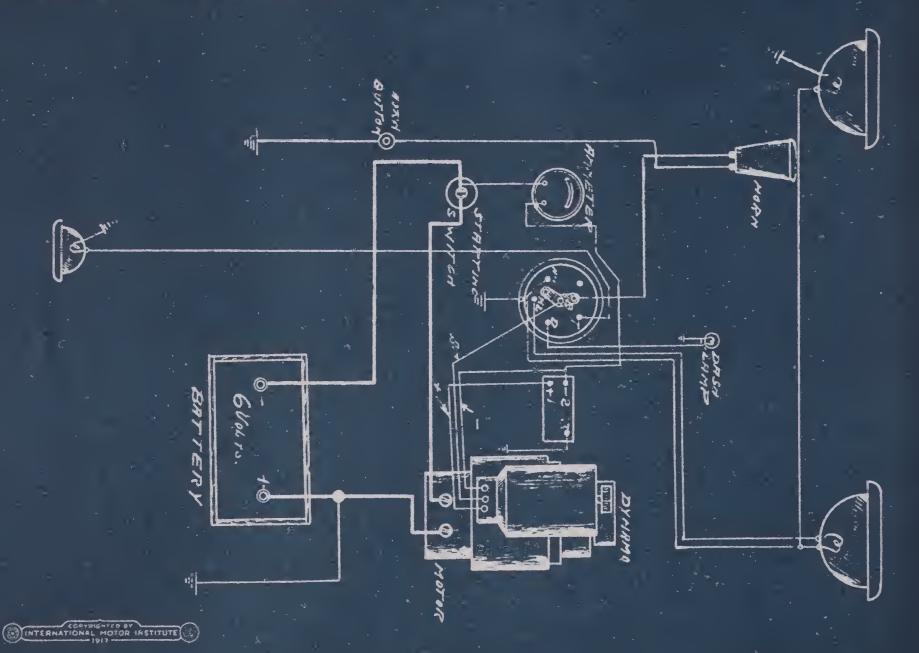


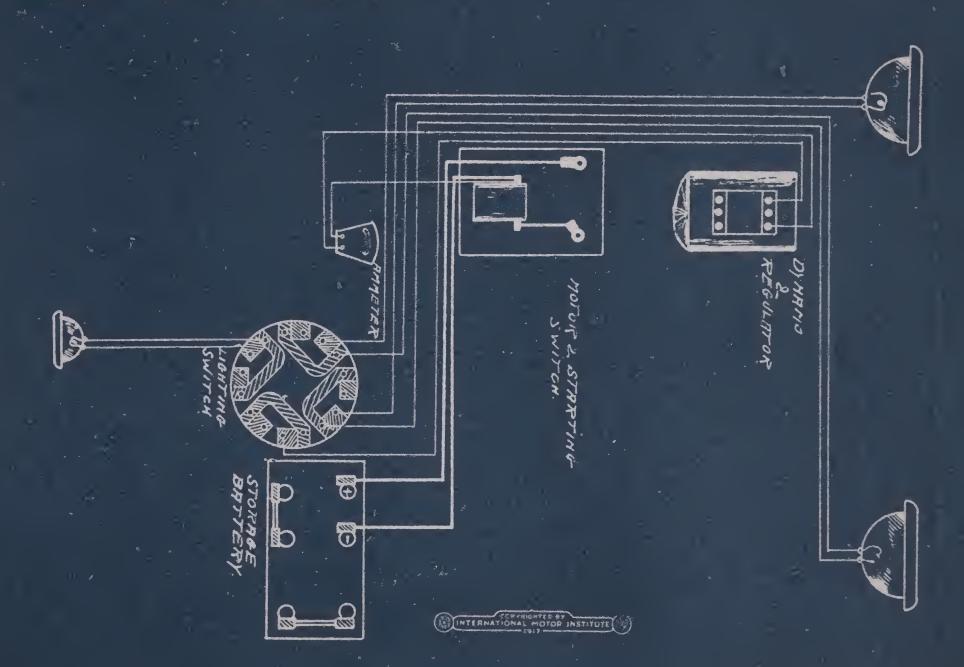


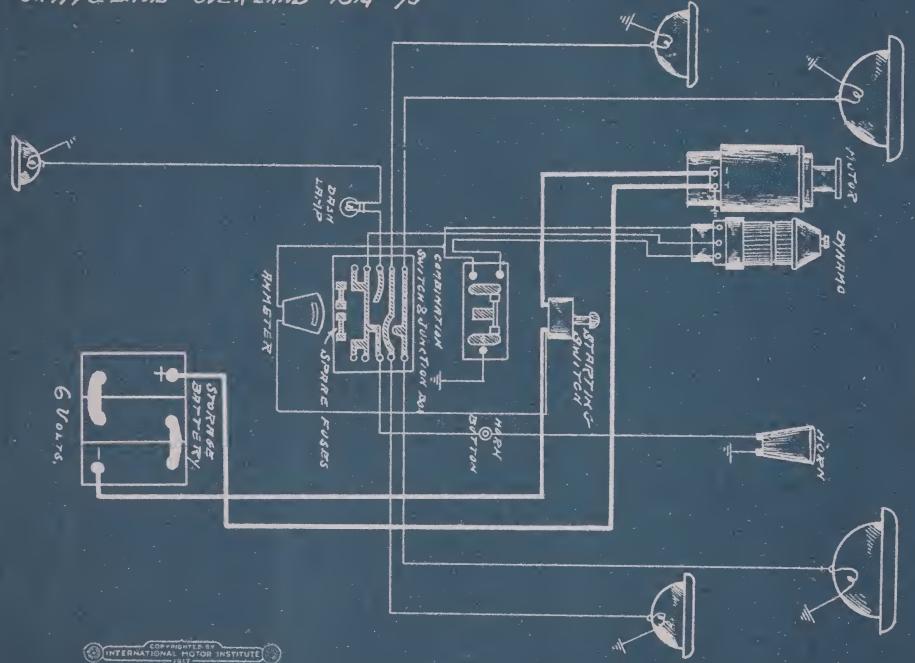


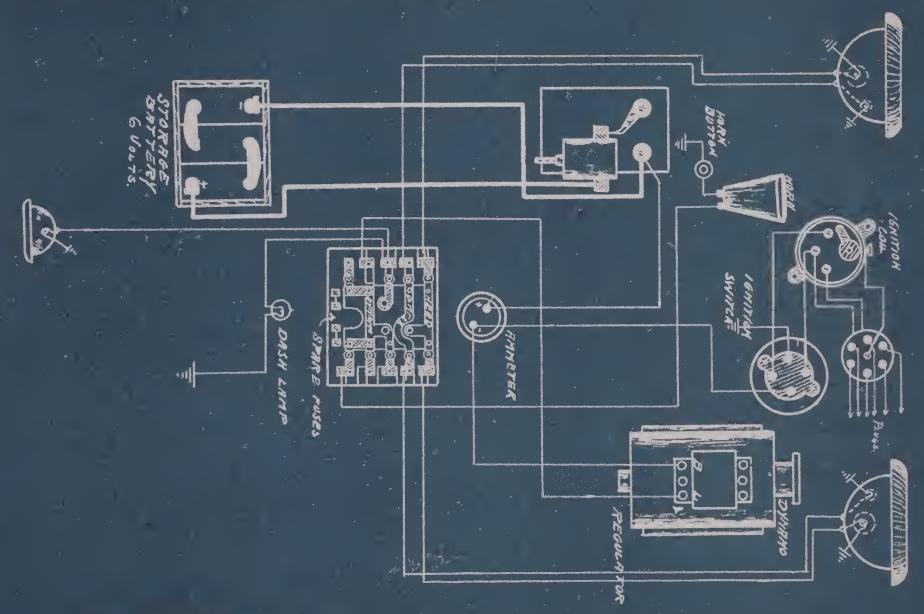




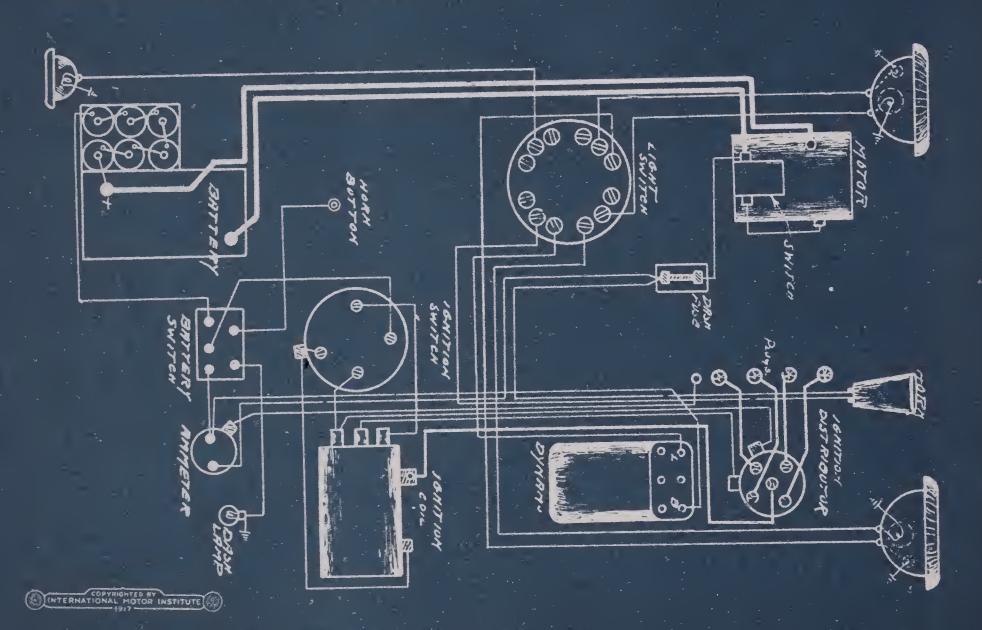


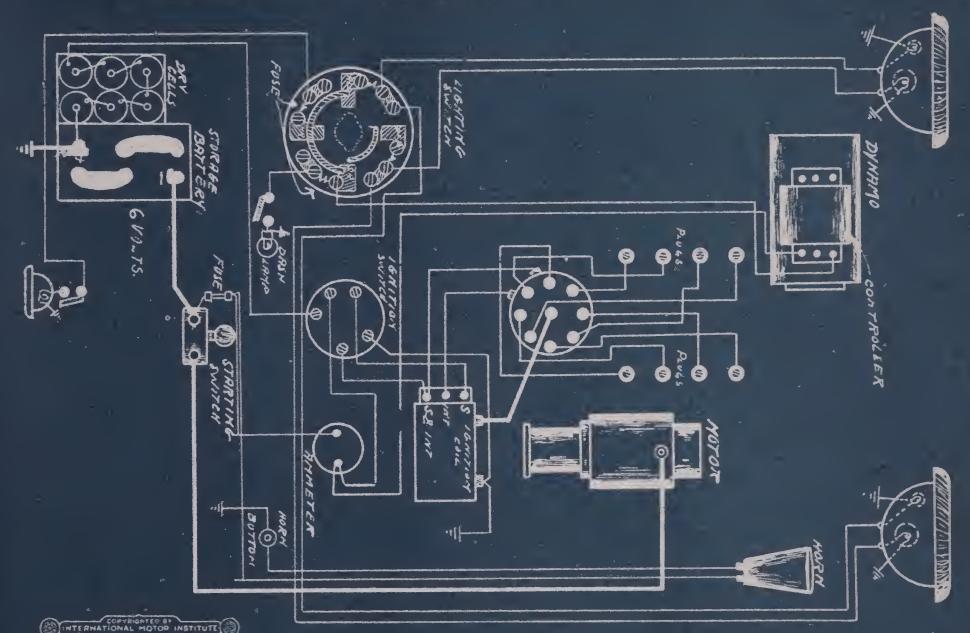




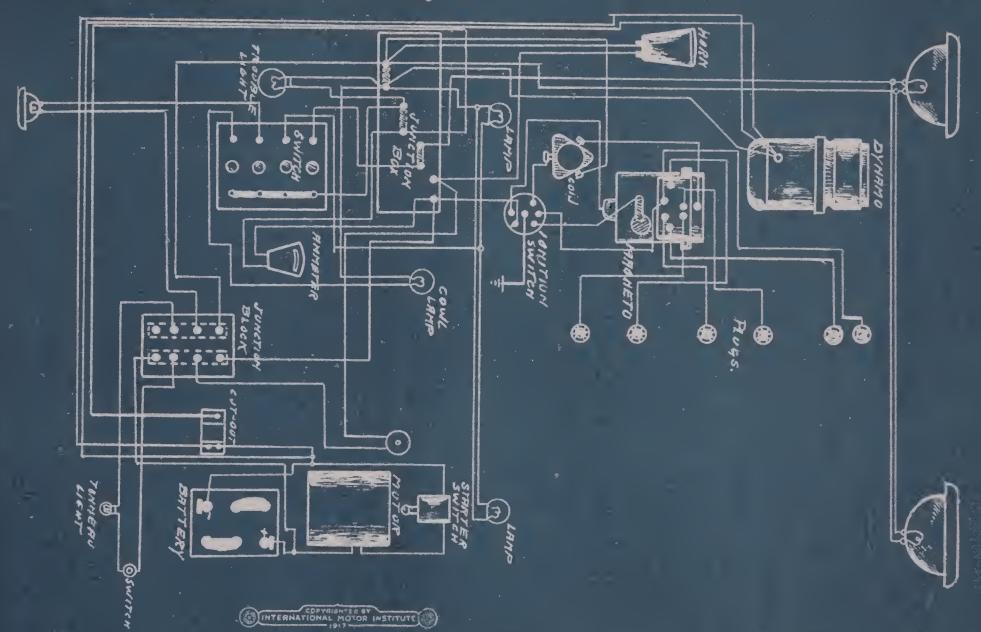


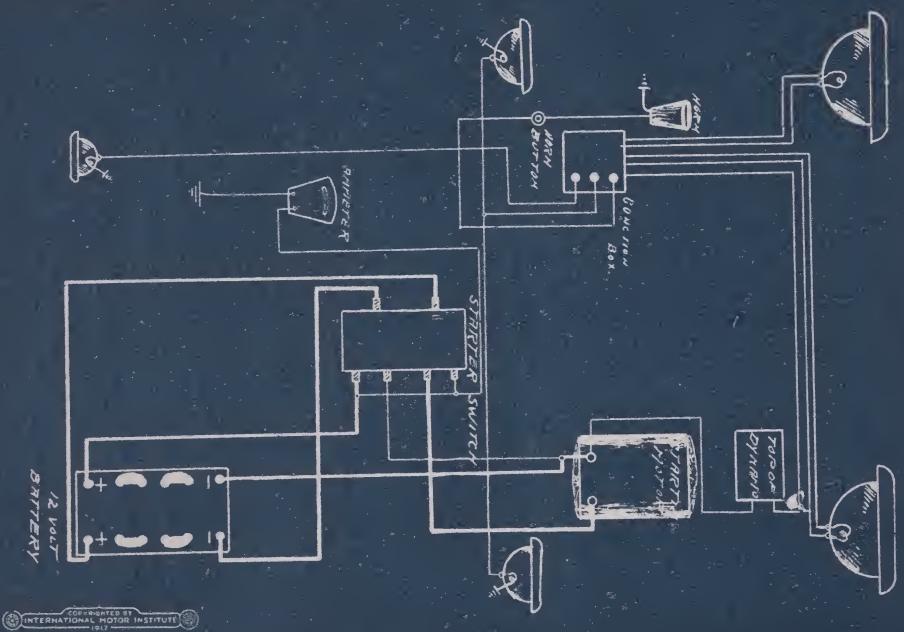
EMAY & DAVIS PEERLESS 1915

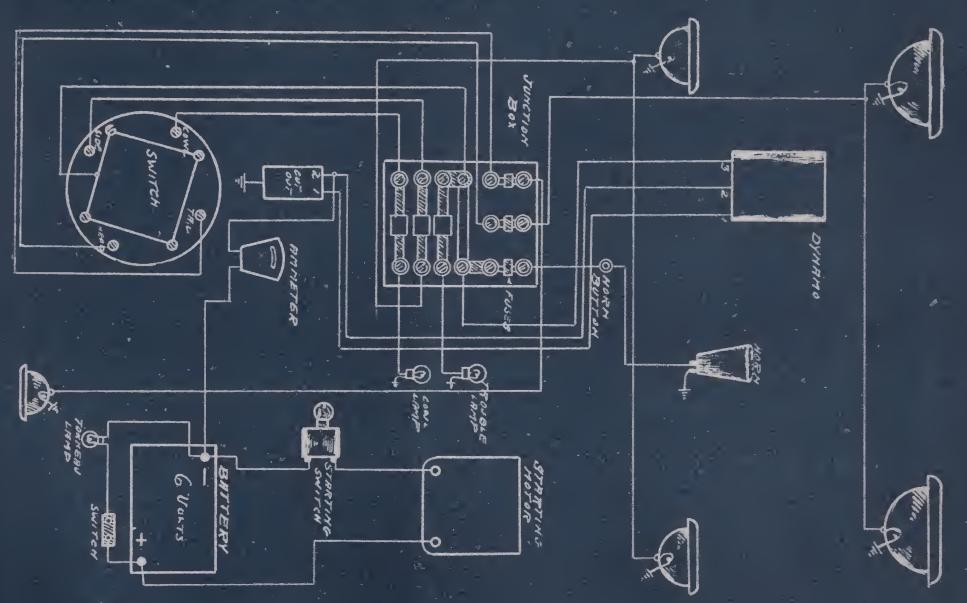


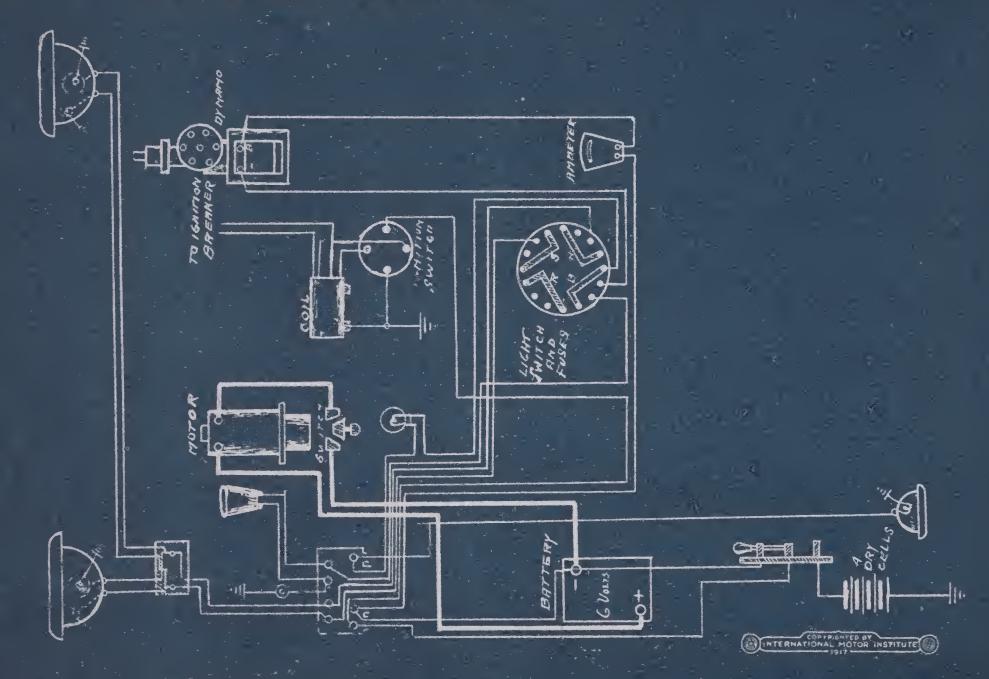


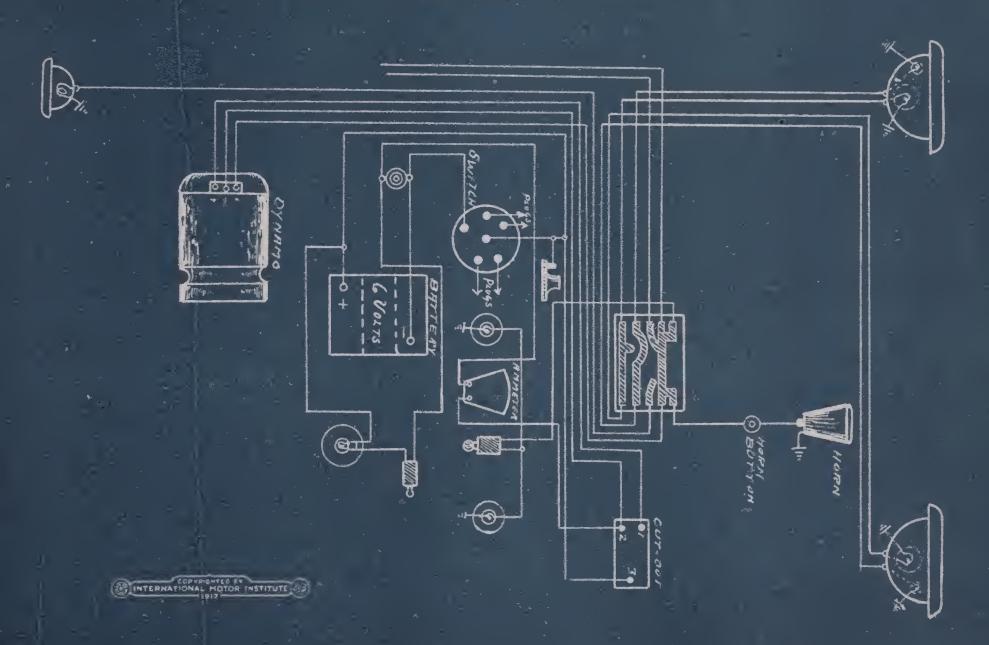
GRAY & DAVIS SAXON 1915-16 "6" INTERNATIONAL MOTOR INSTITUTE

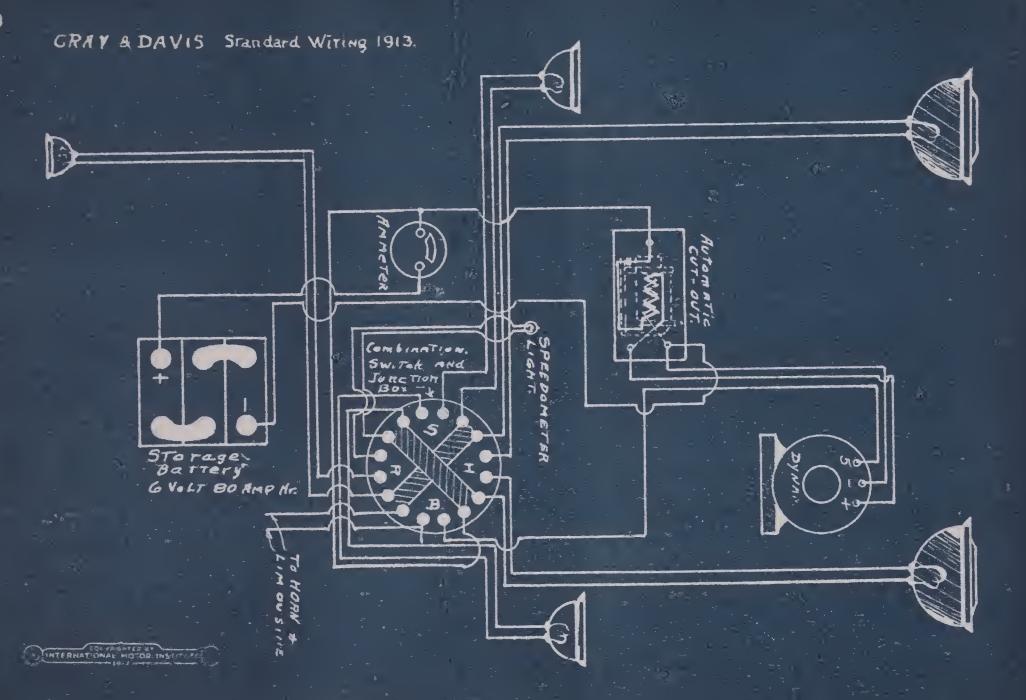


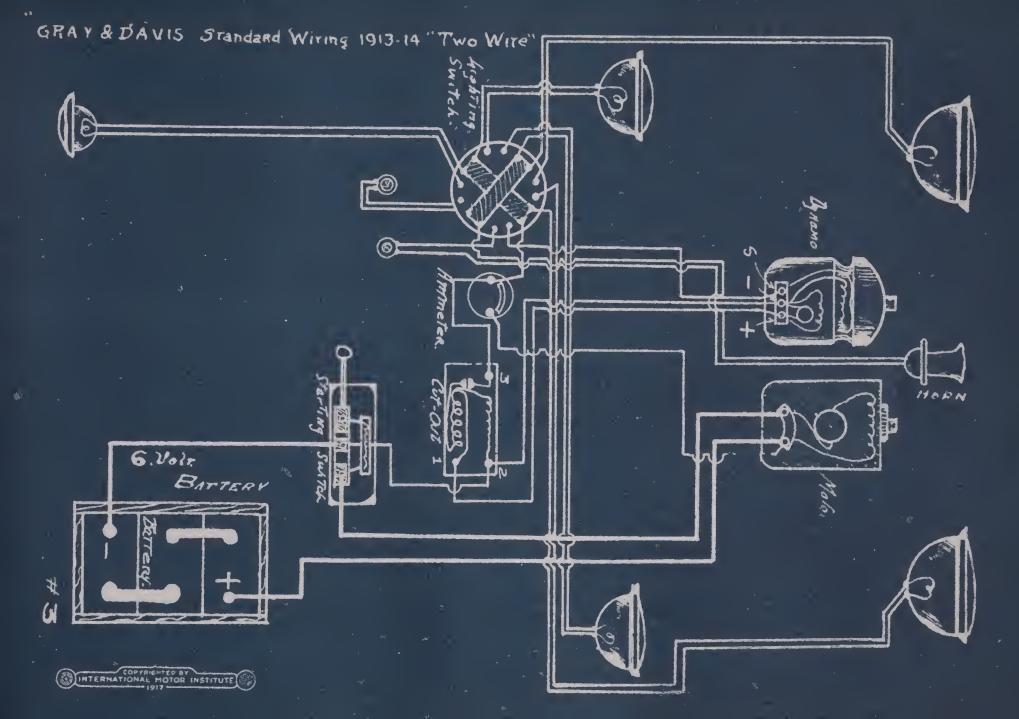


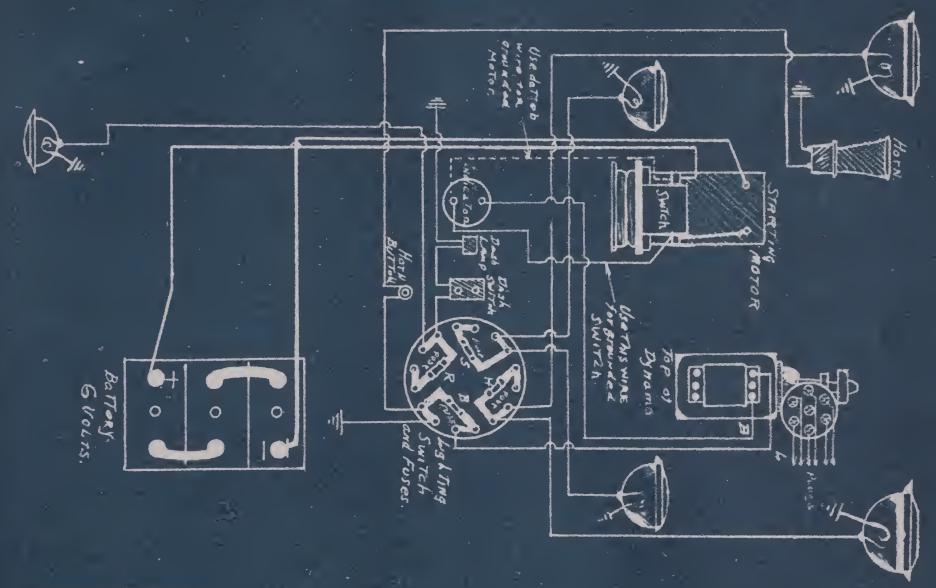




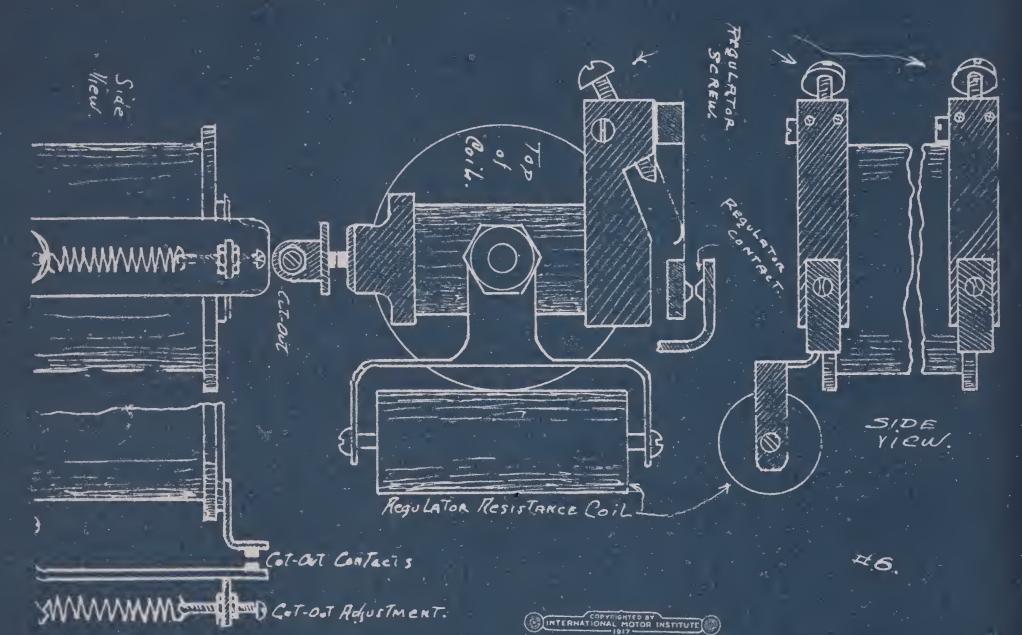


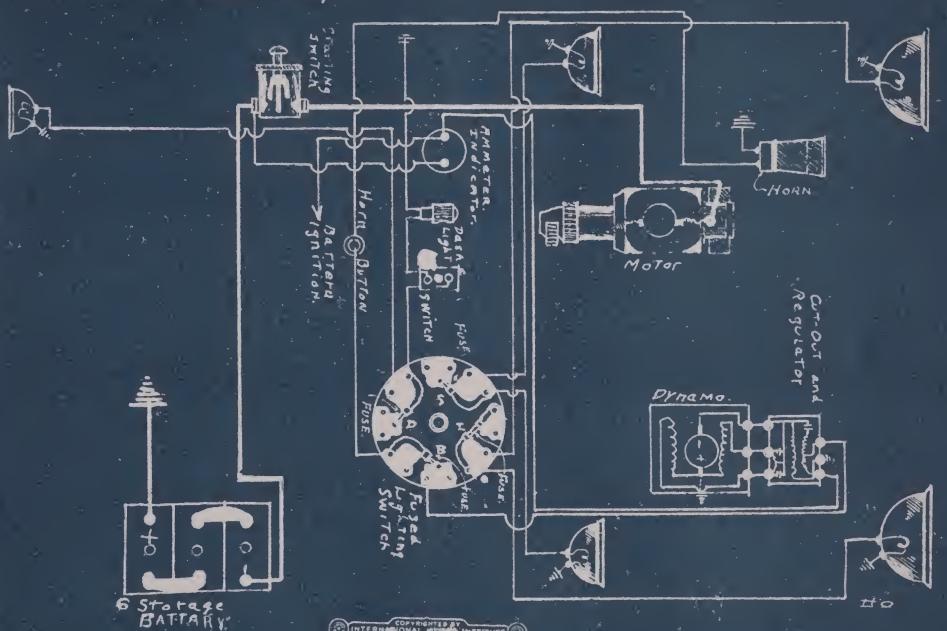




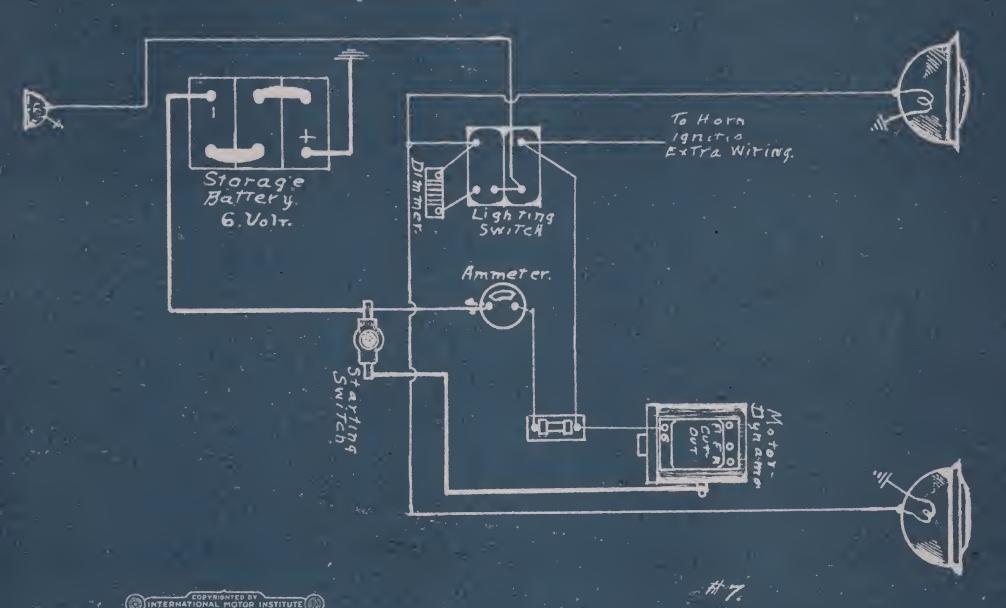


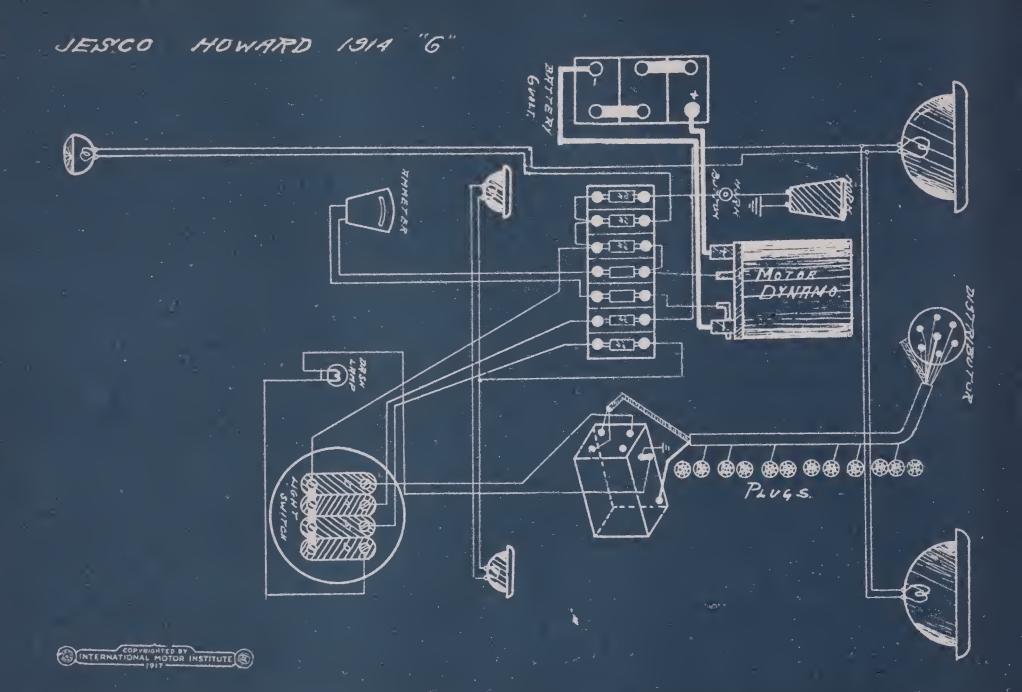


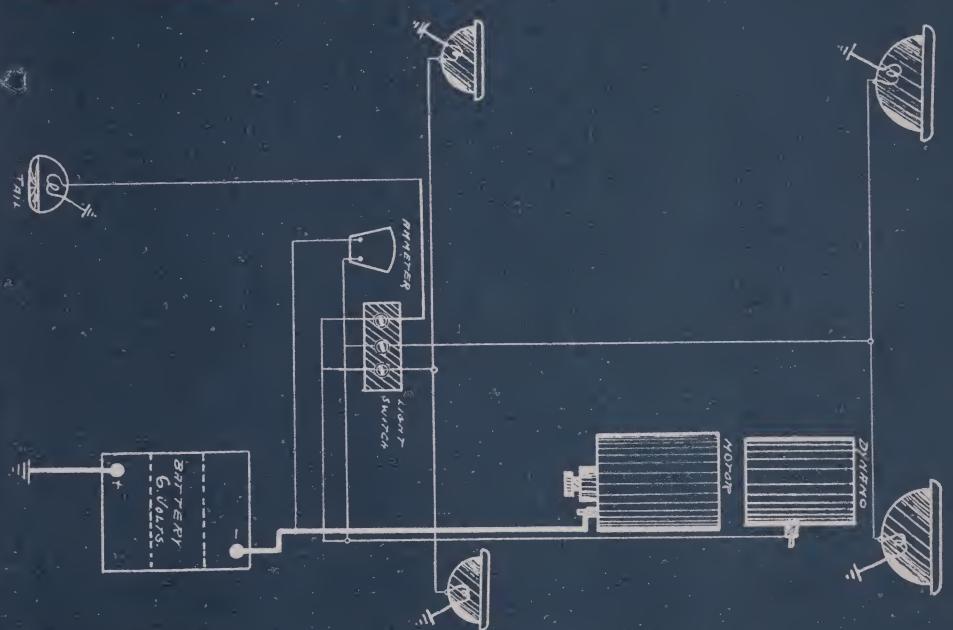




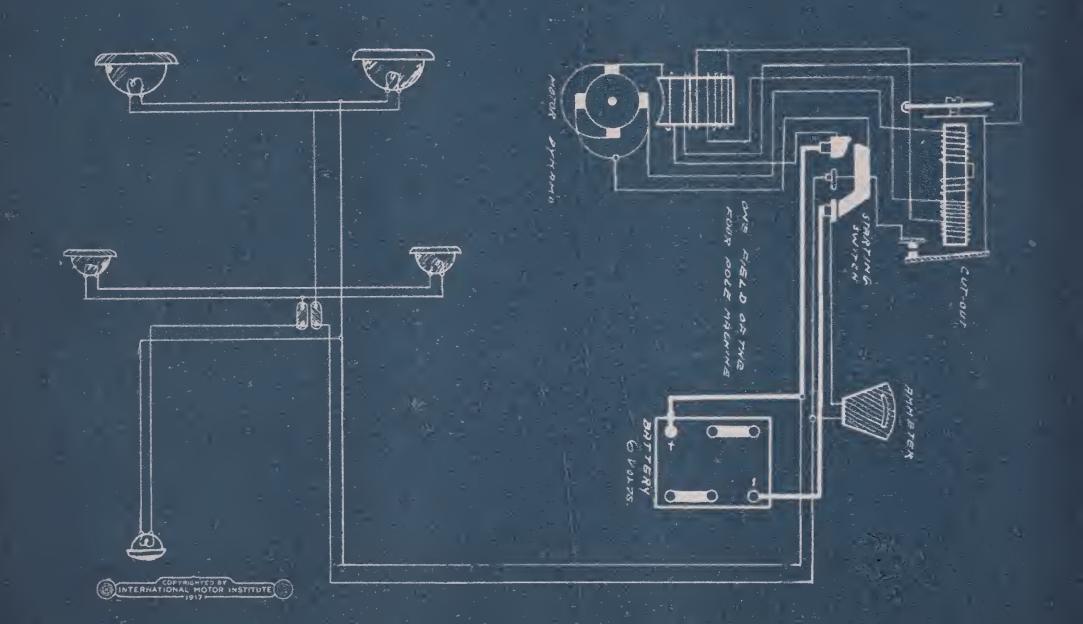




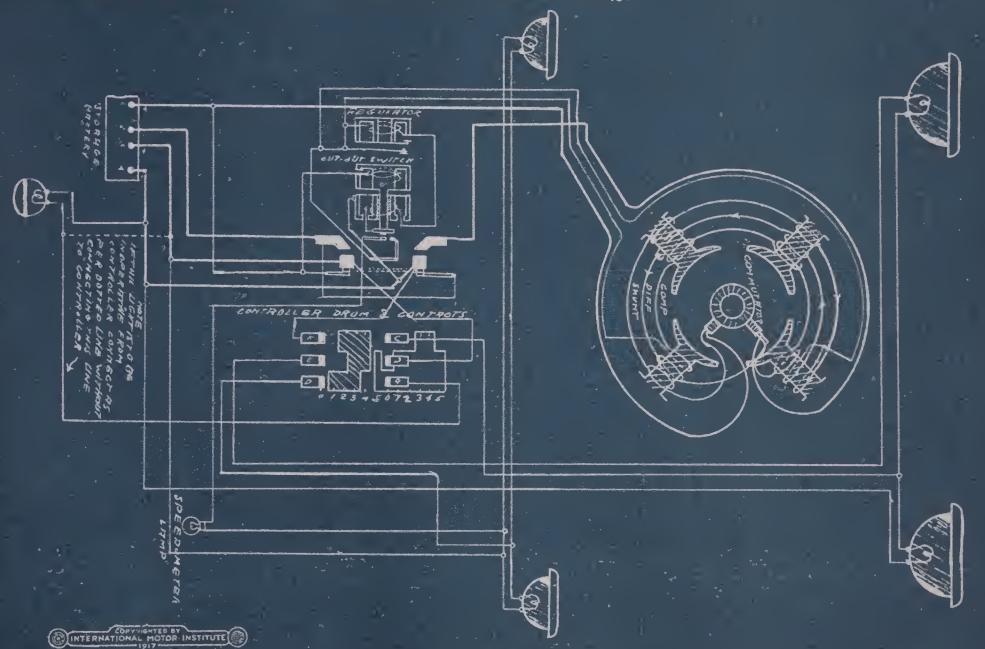




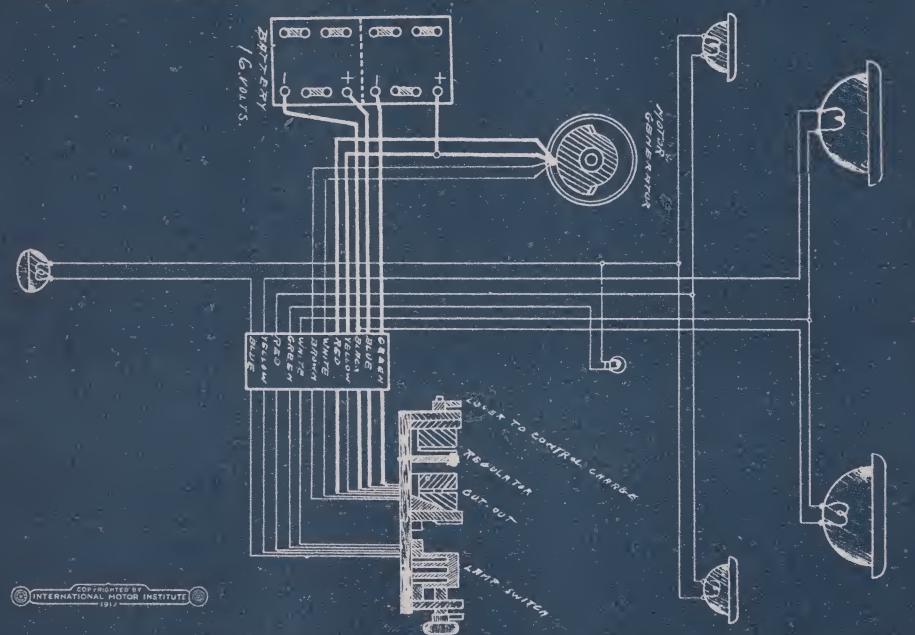
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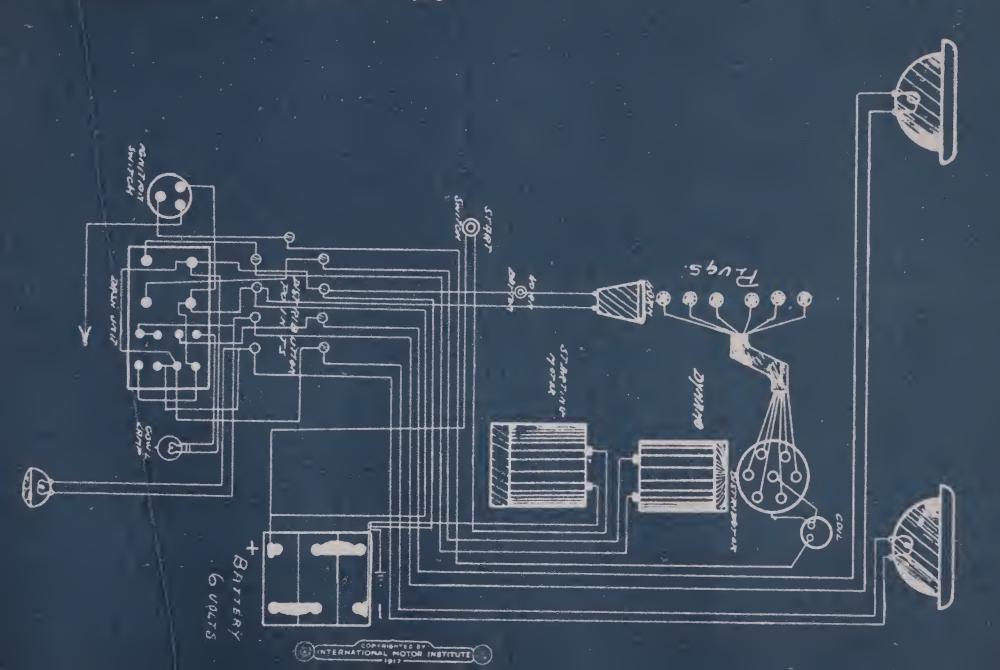


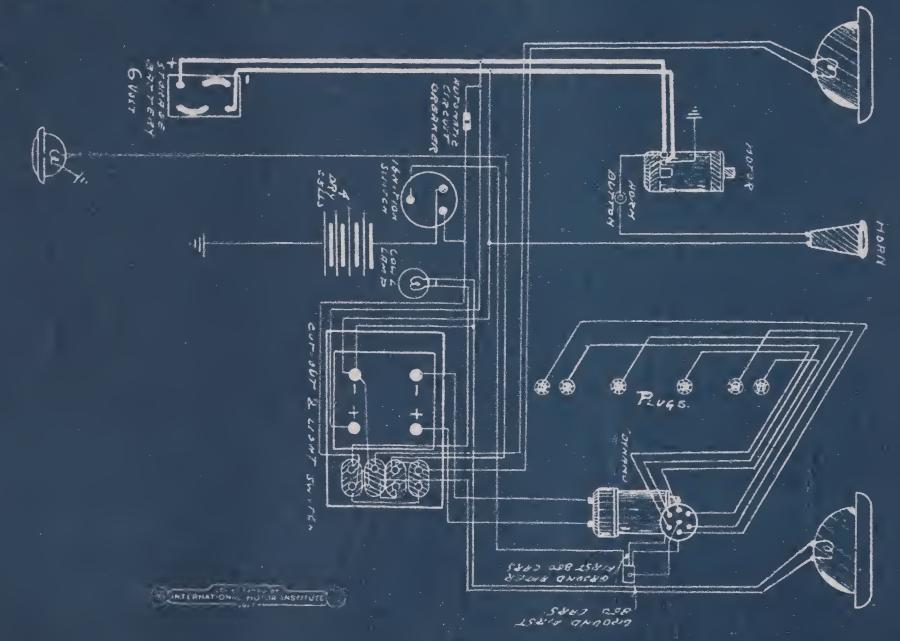
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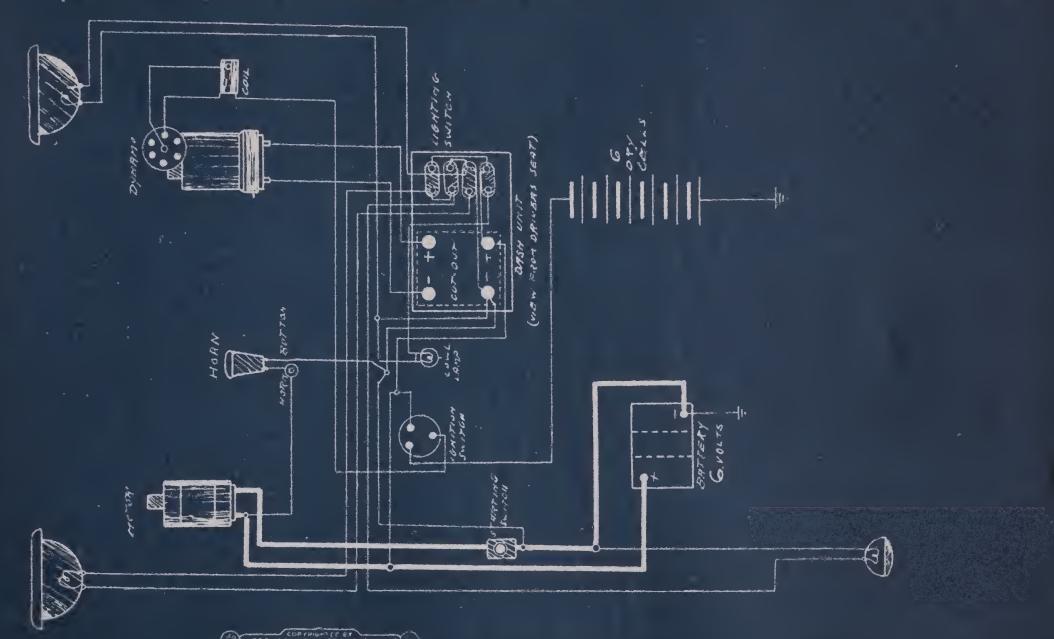


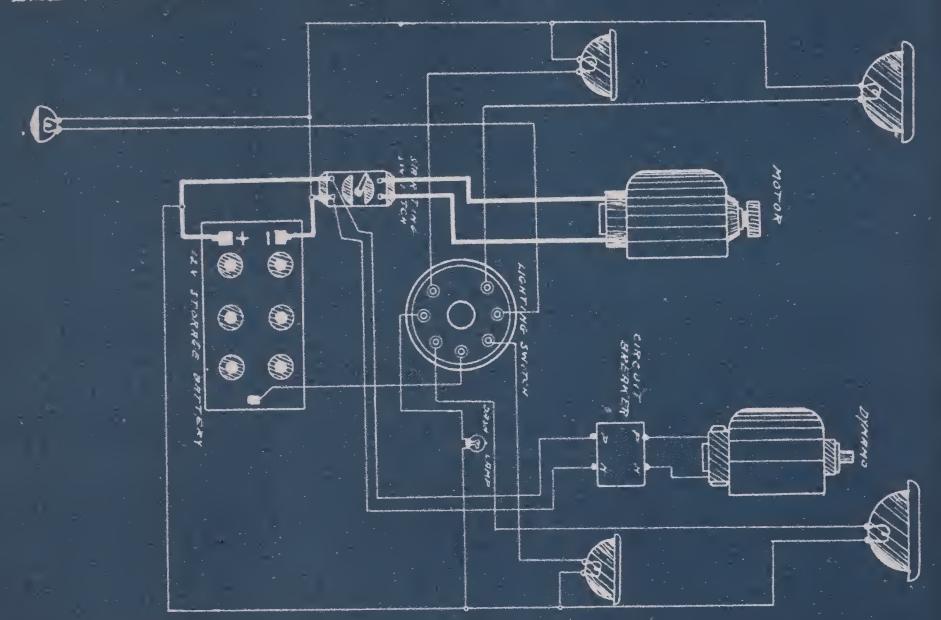
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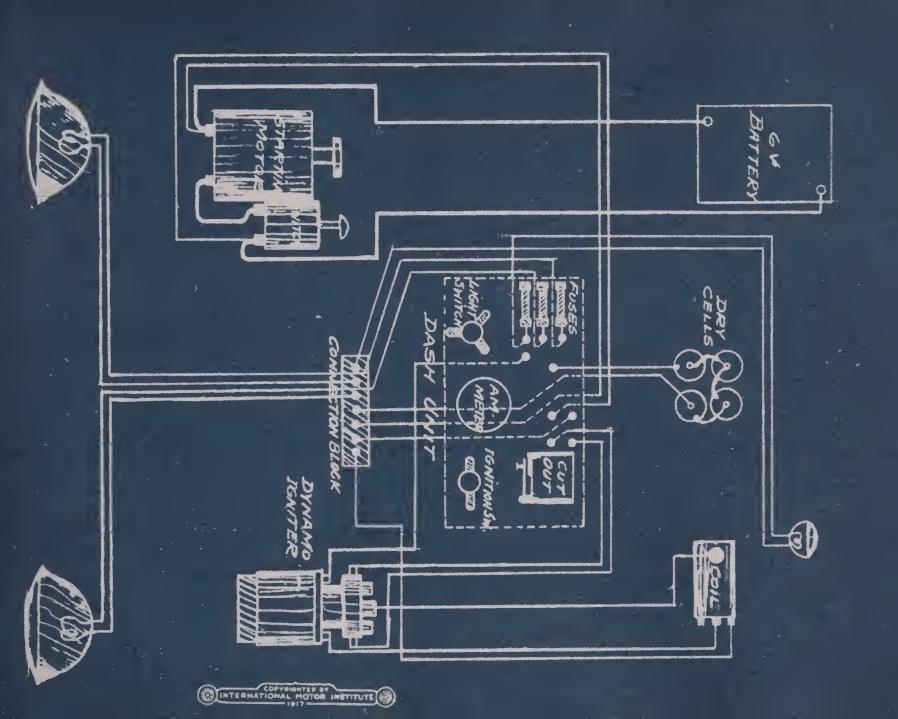


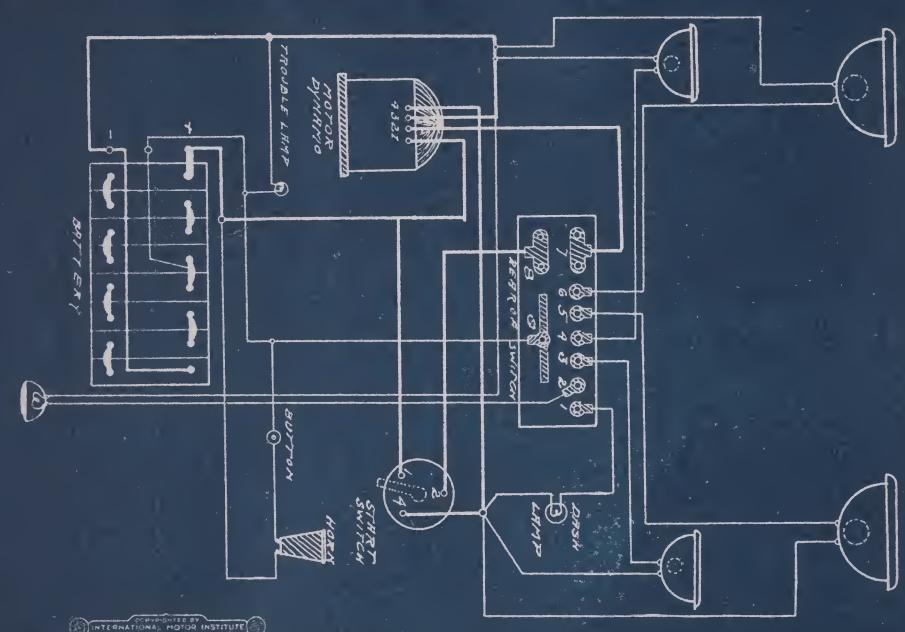




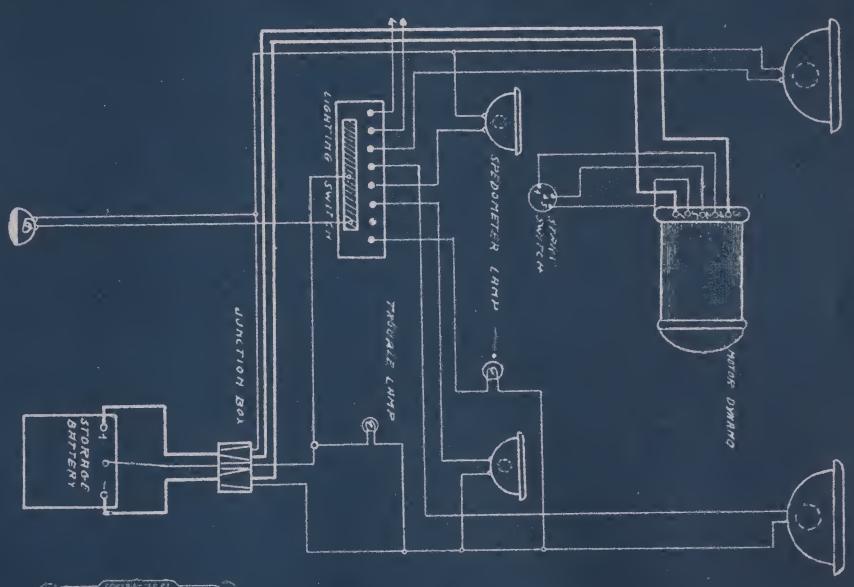




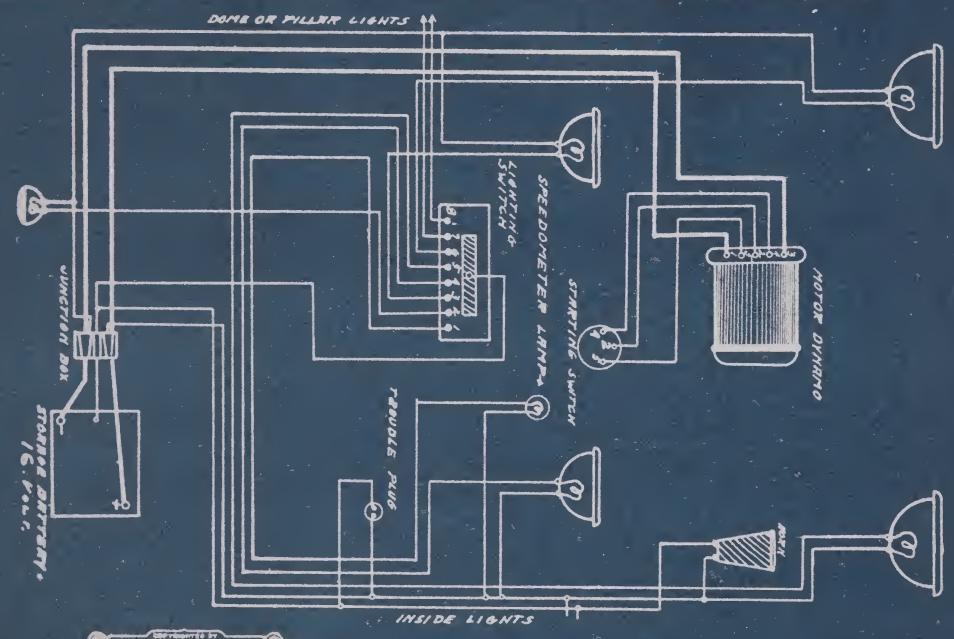


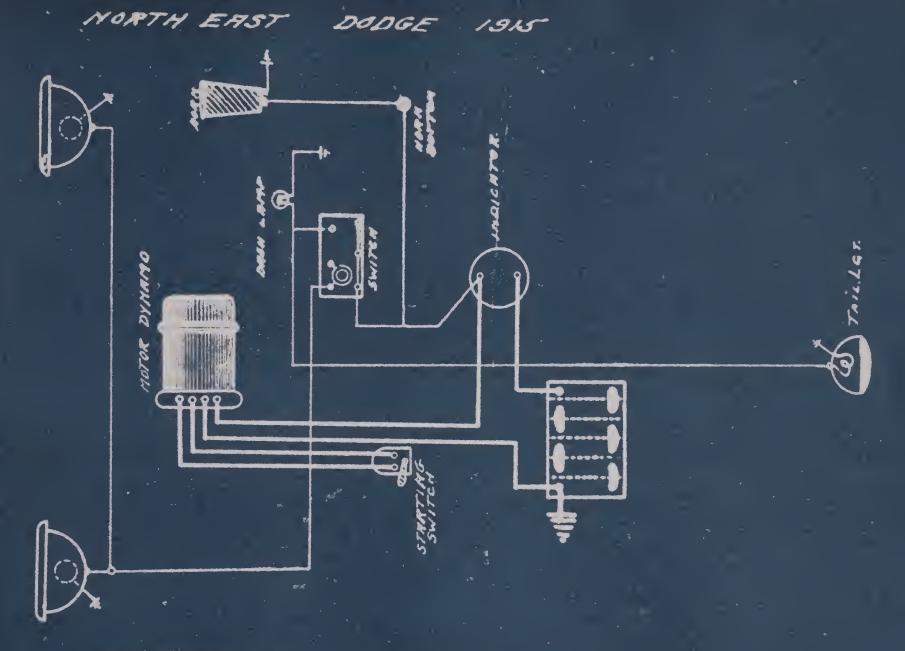


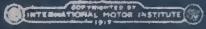
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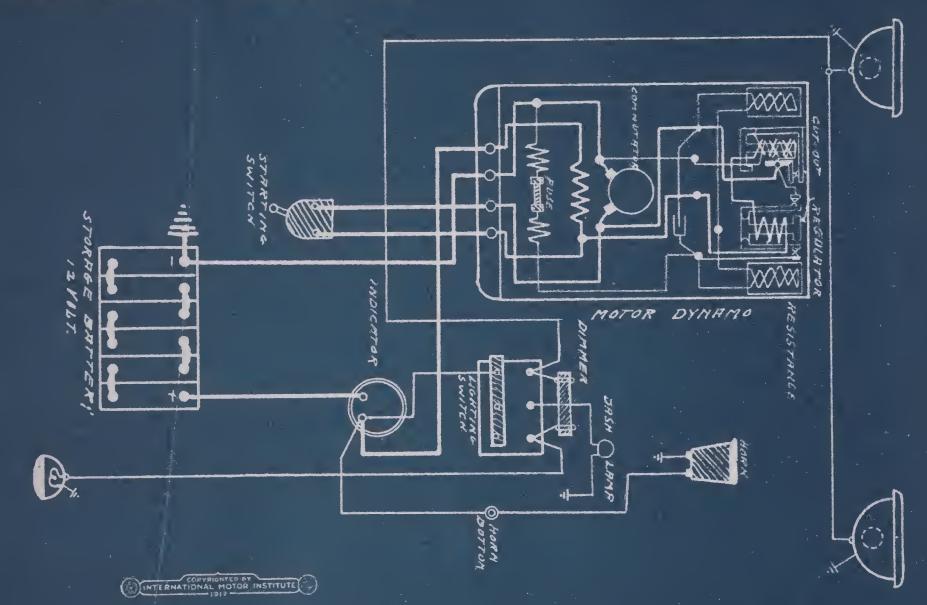


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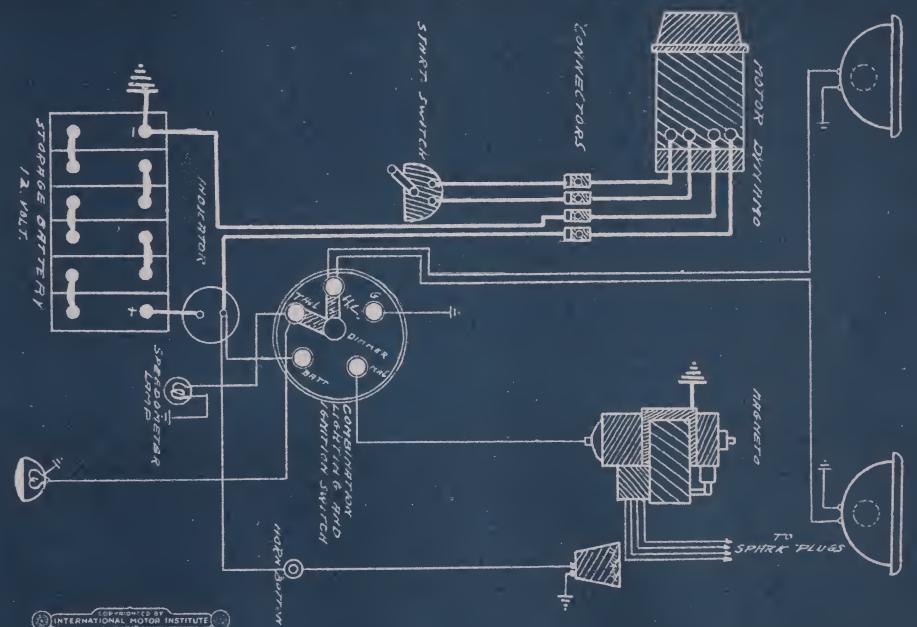


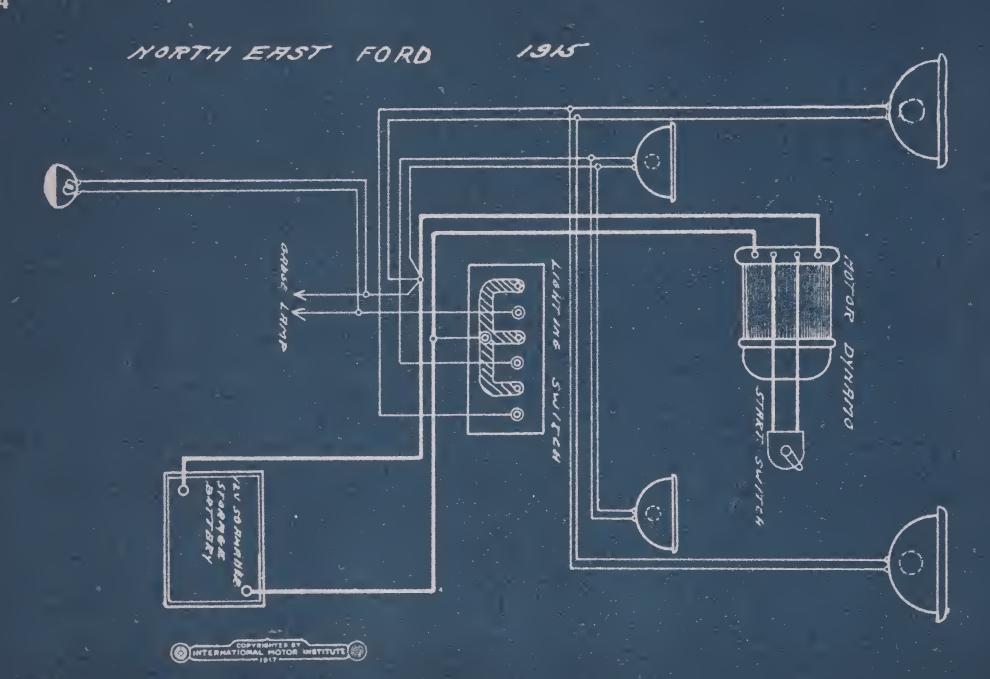


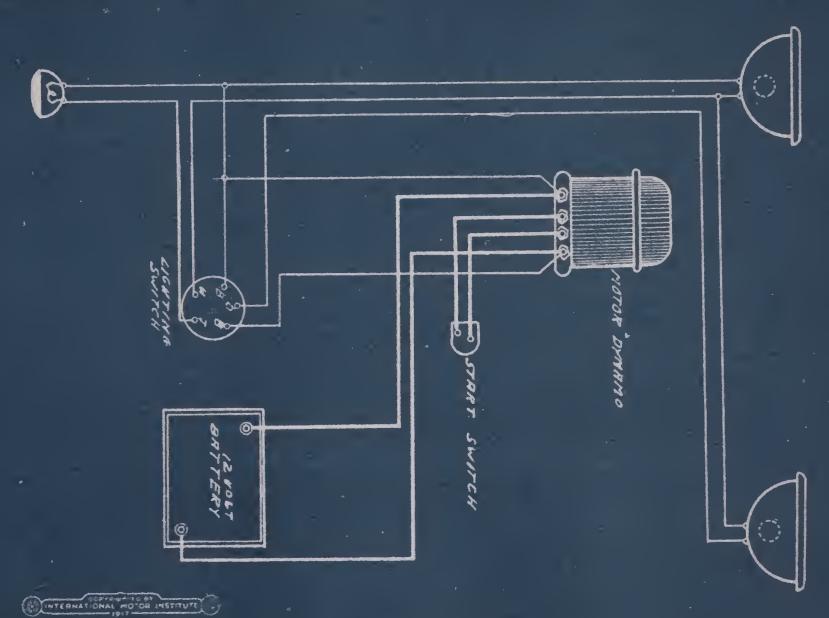


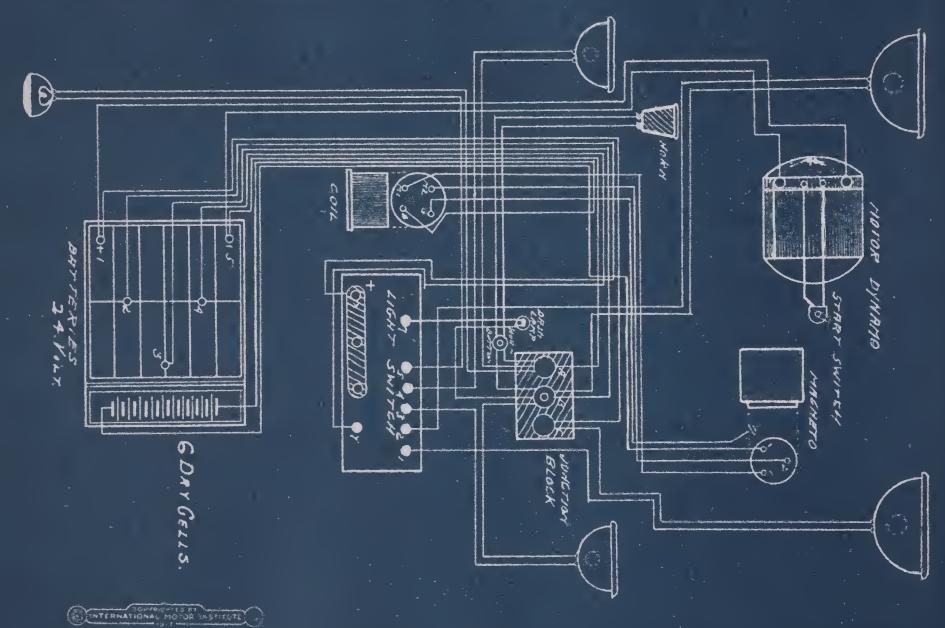


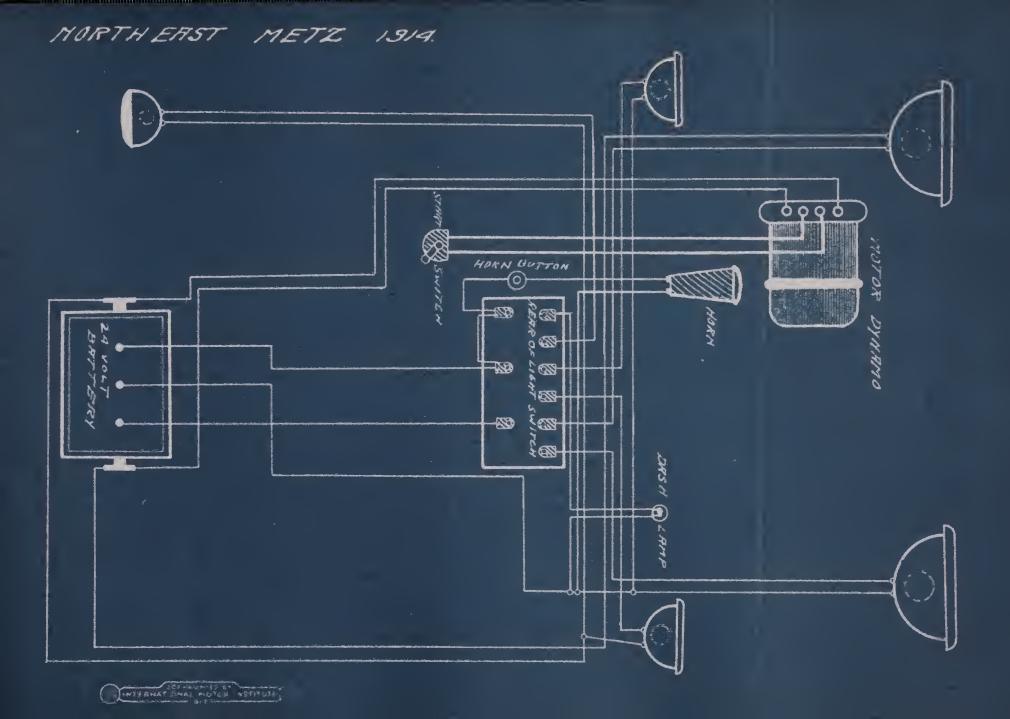
MORTH EAST DOOGE 1916 COMB. LIGHTS & 16M. SWITCH.

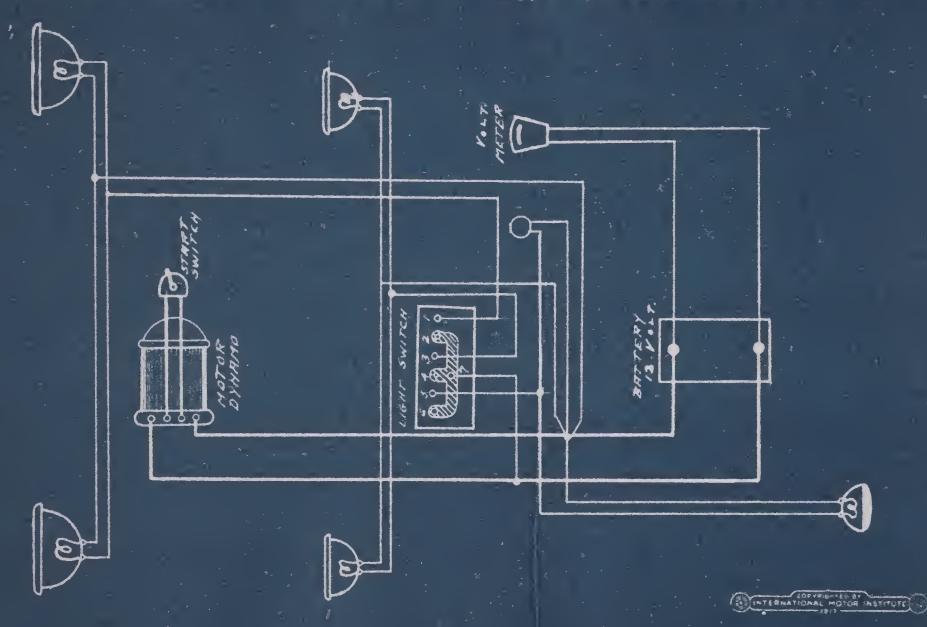


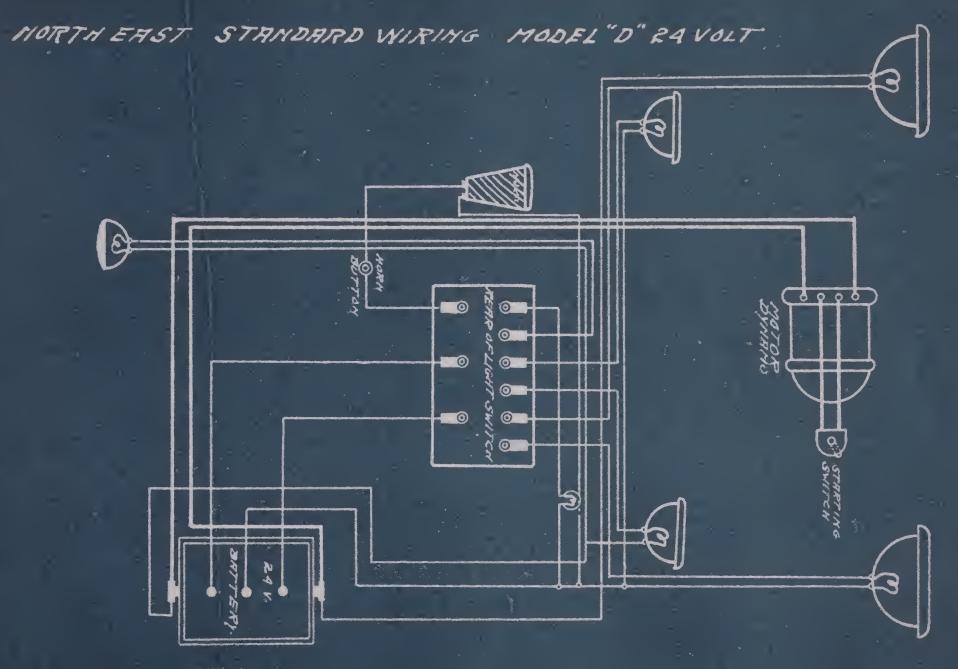




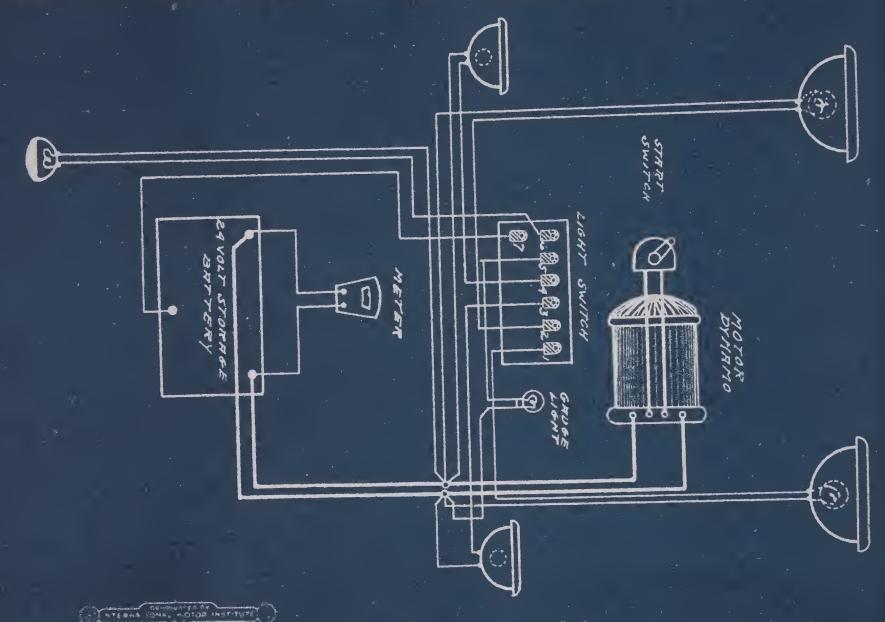


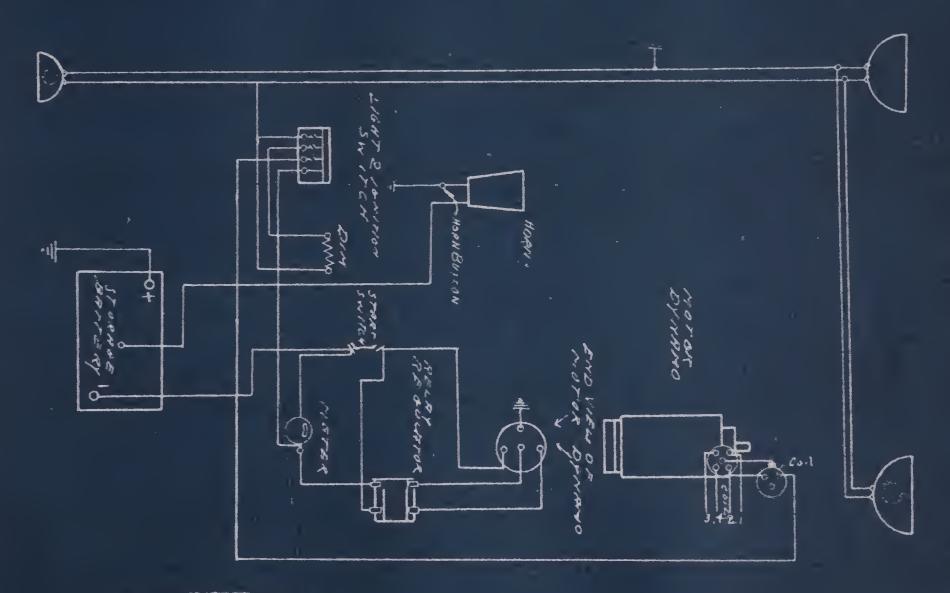




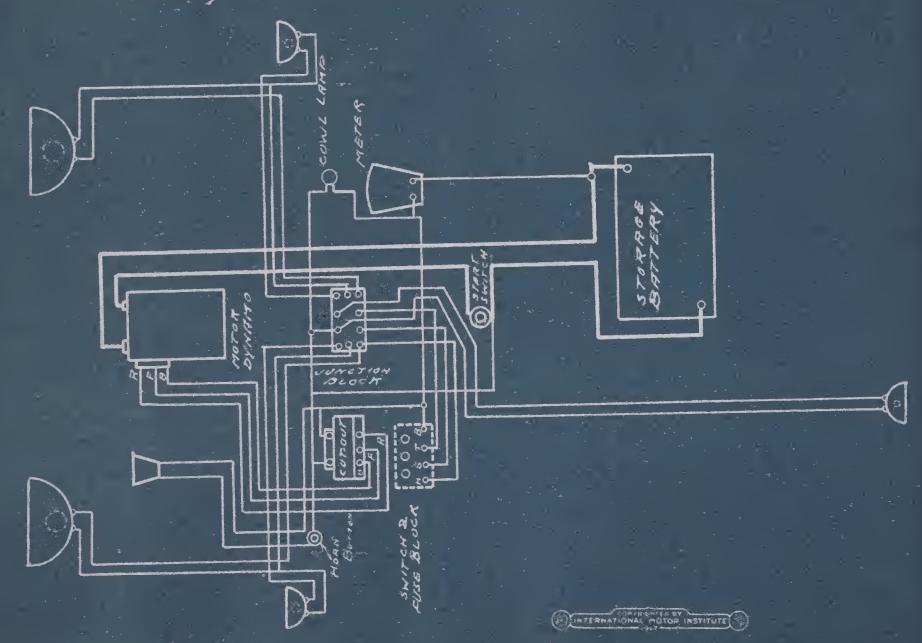


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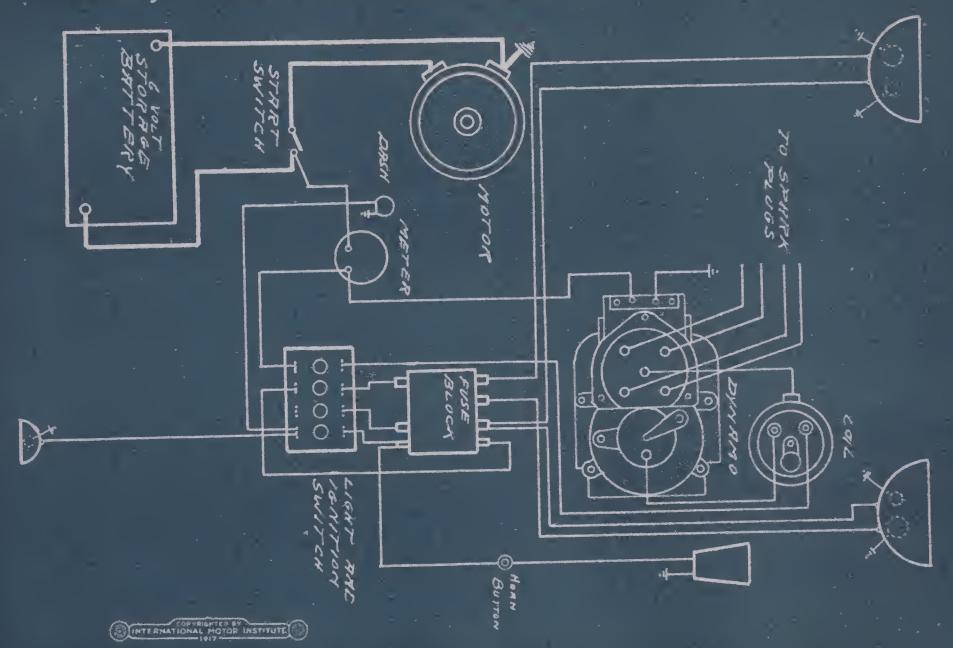


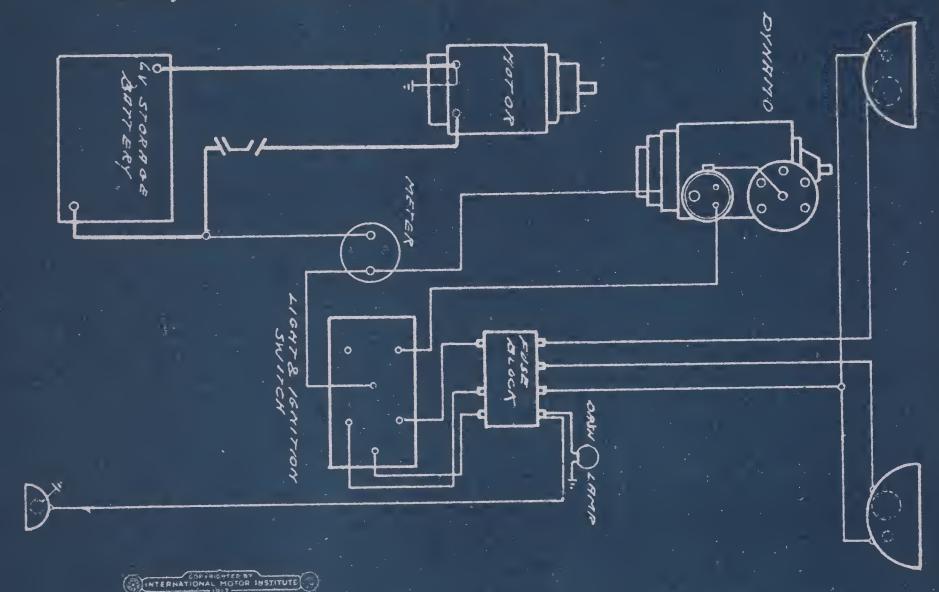


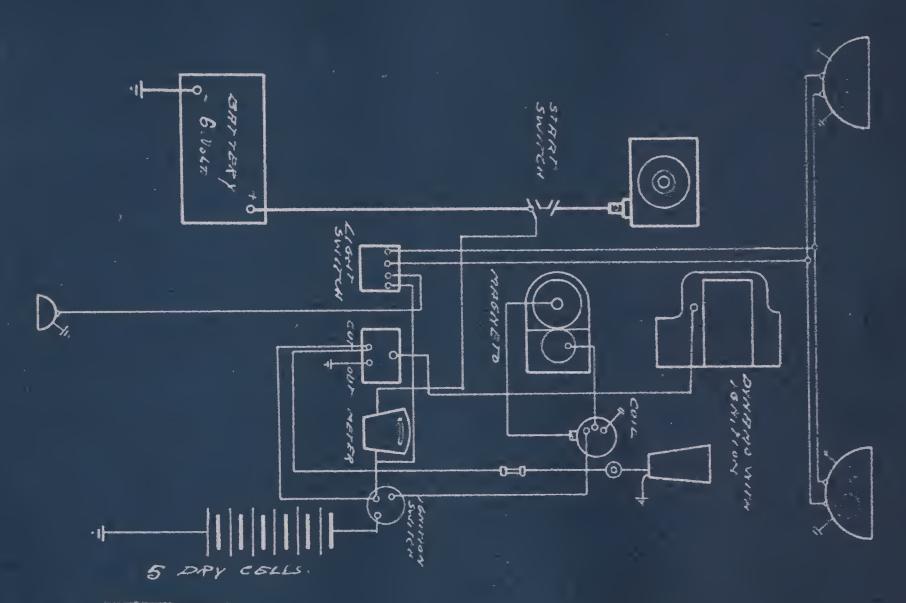


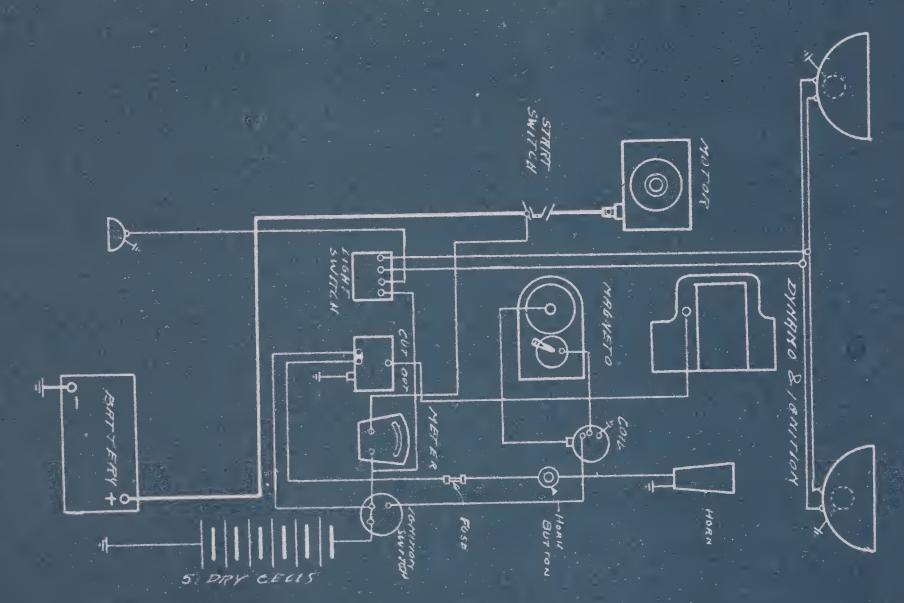


REMY AUBURN 1915 "4-36"



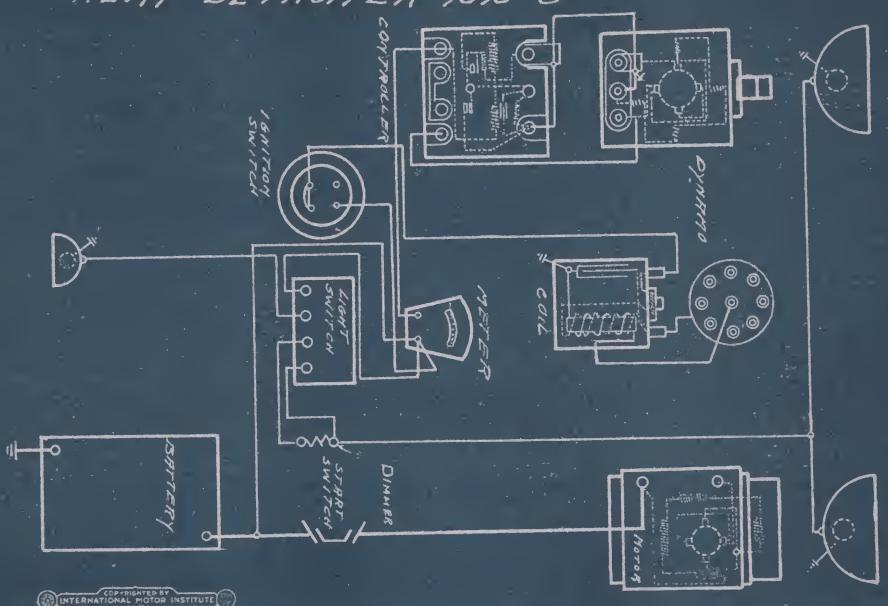


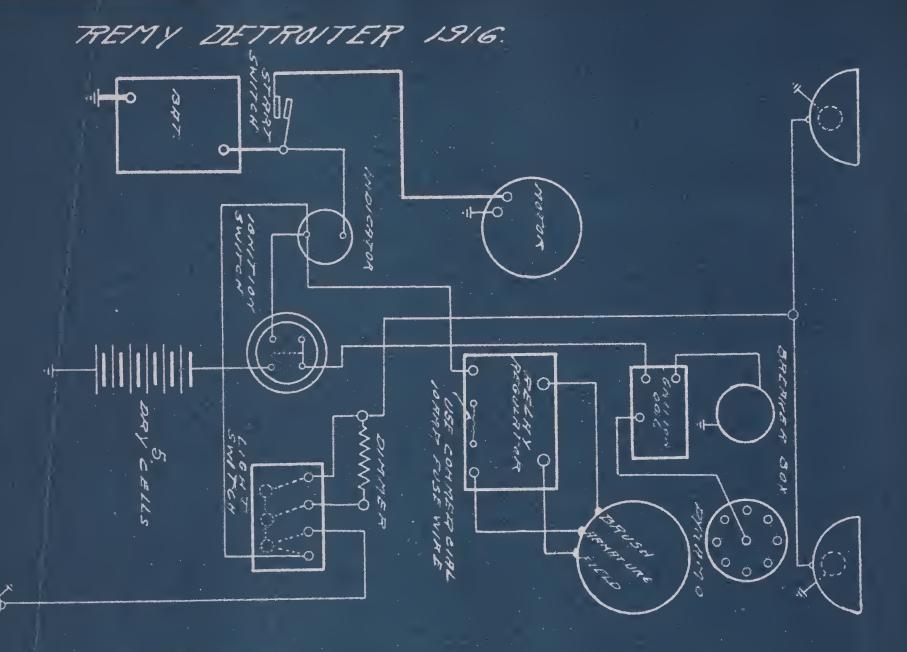




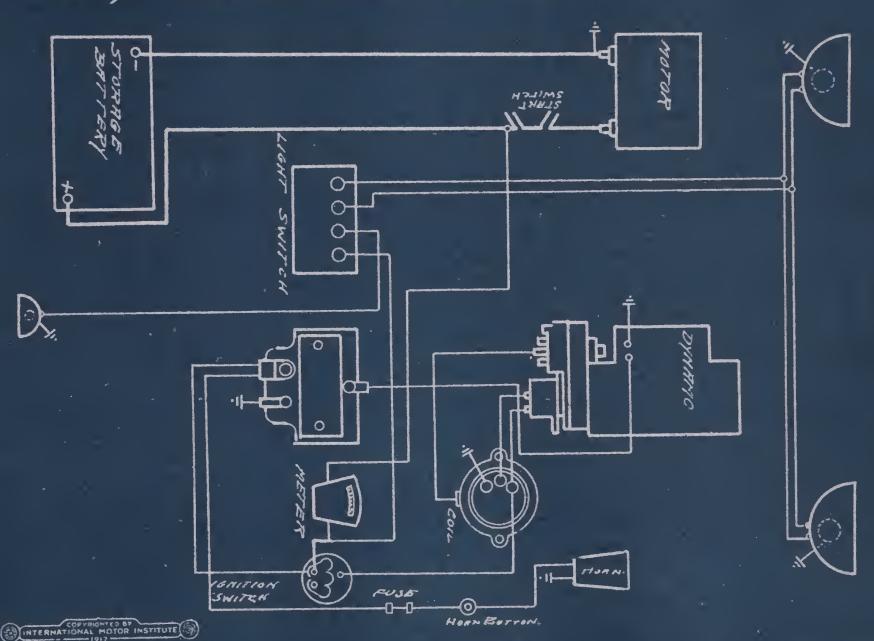
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PEMY DETROITER 1915"8"

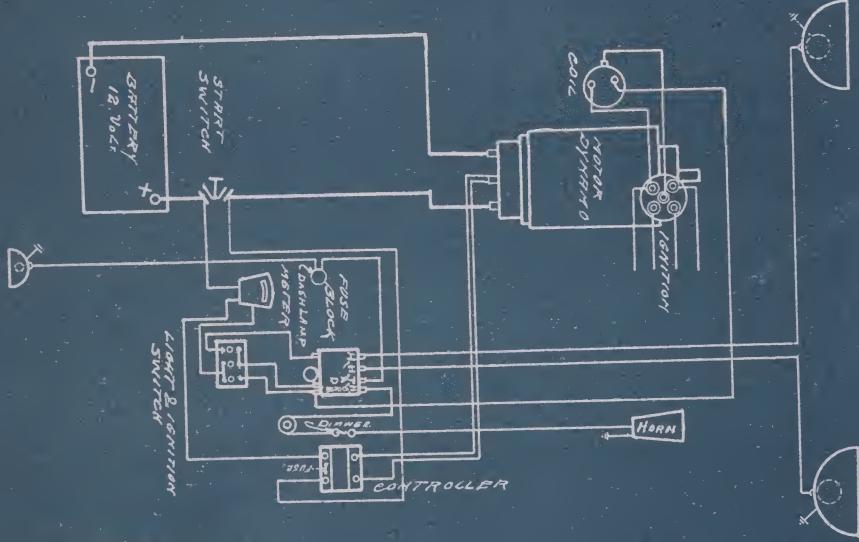


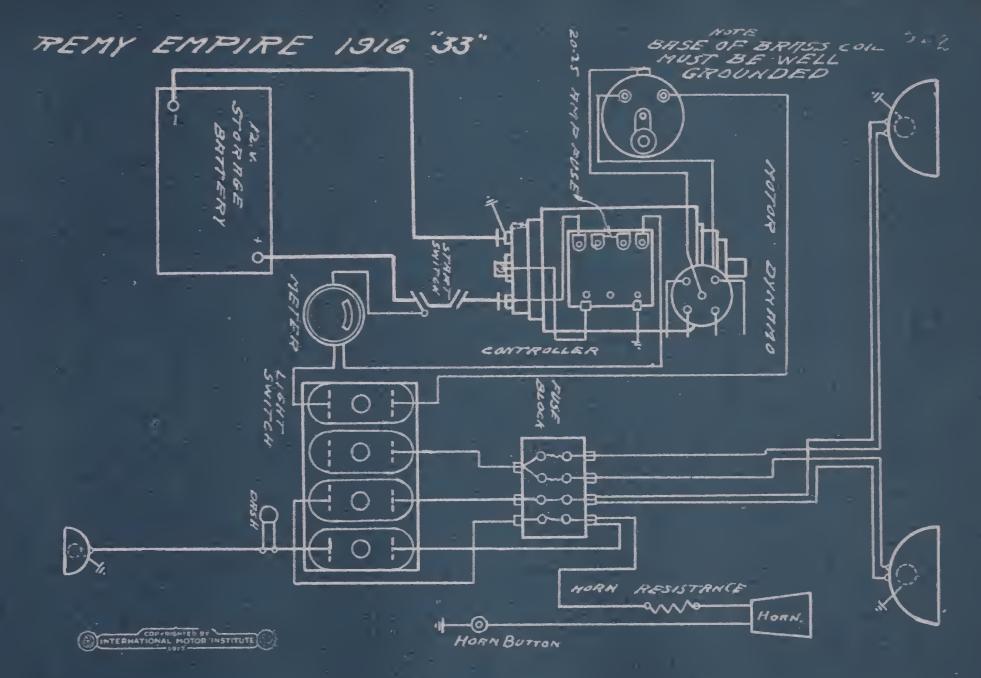


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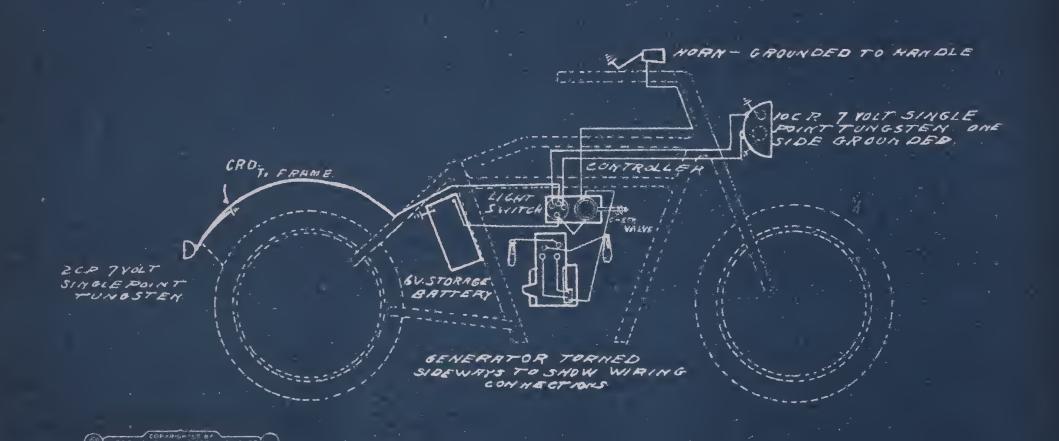


PEMY EMPIRE 1915

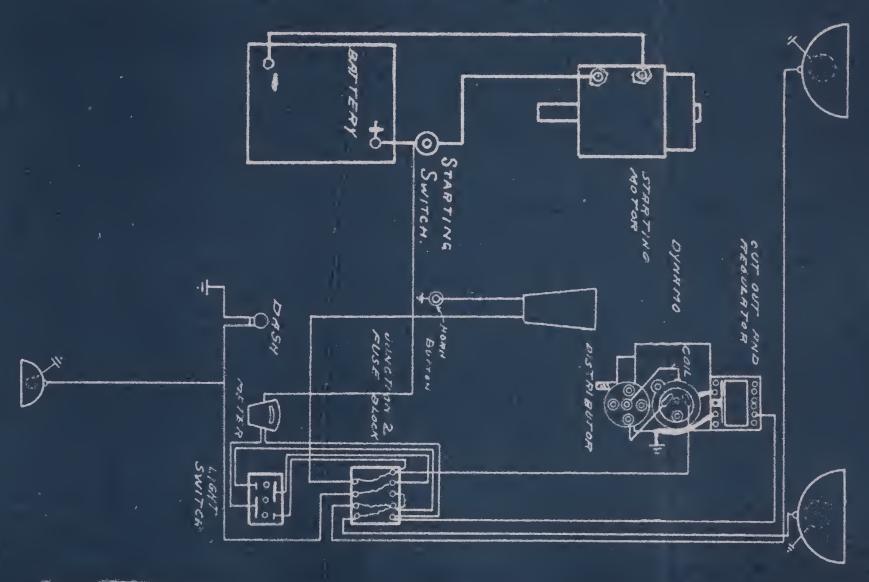




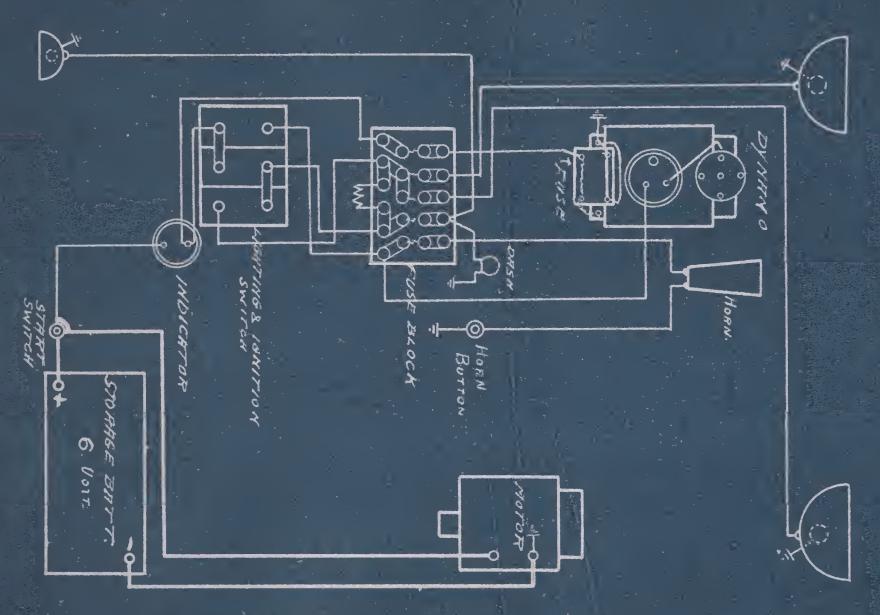
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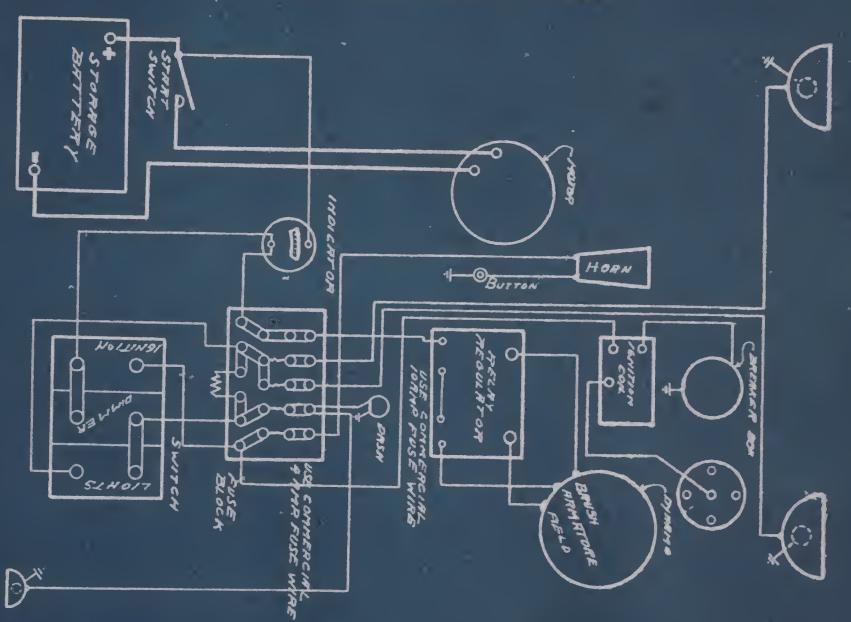


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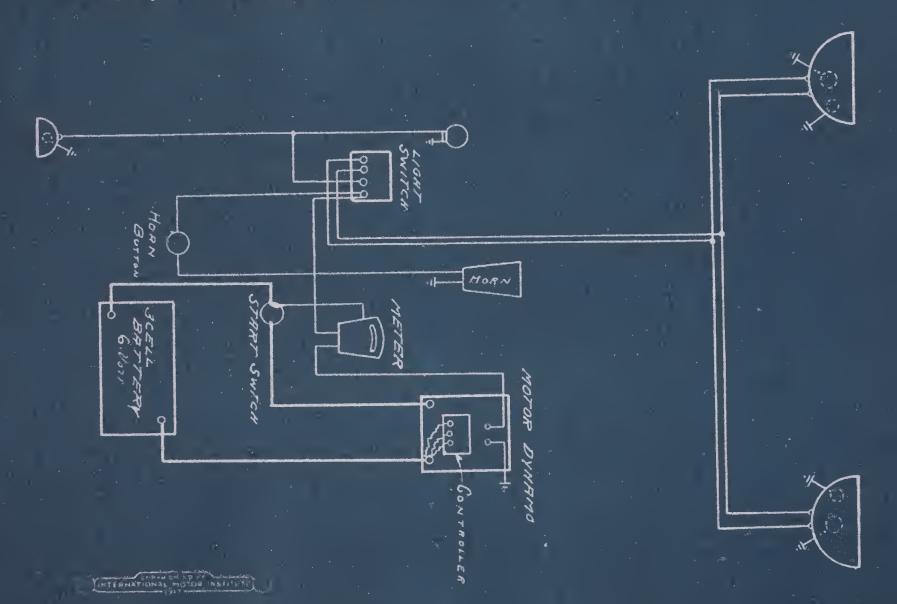


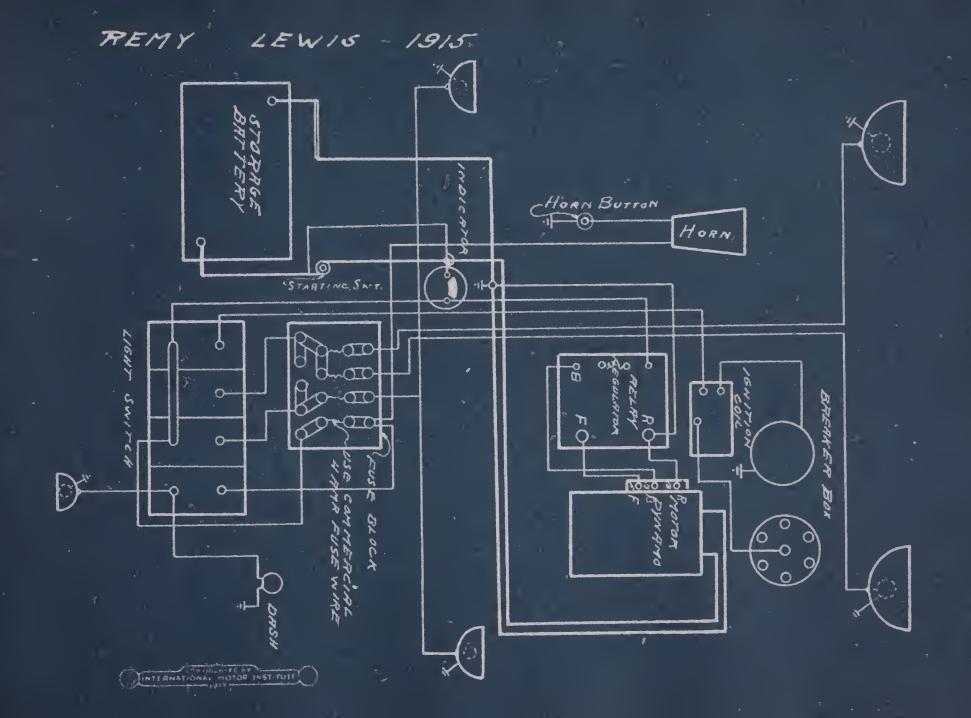
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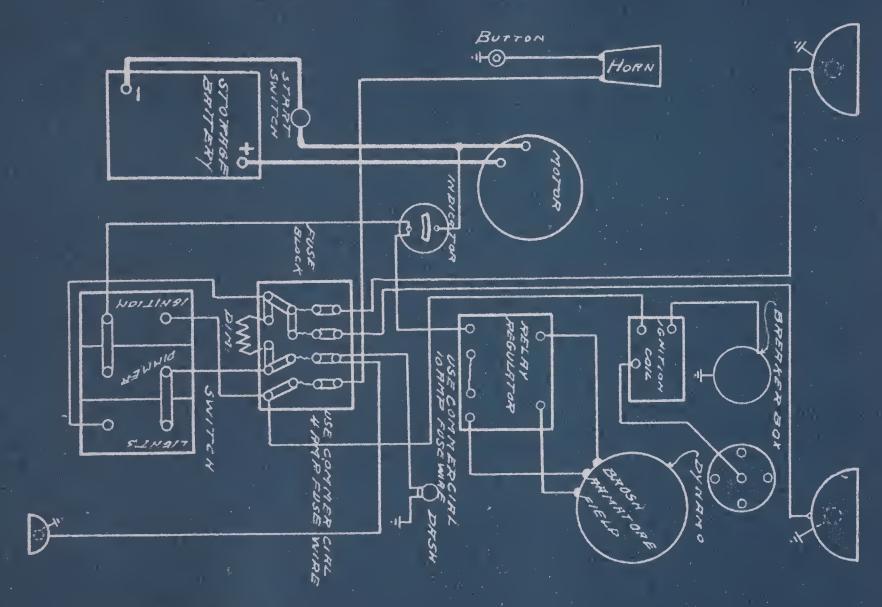




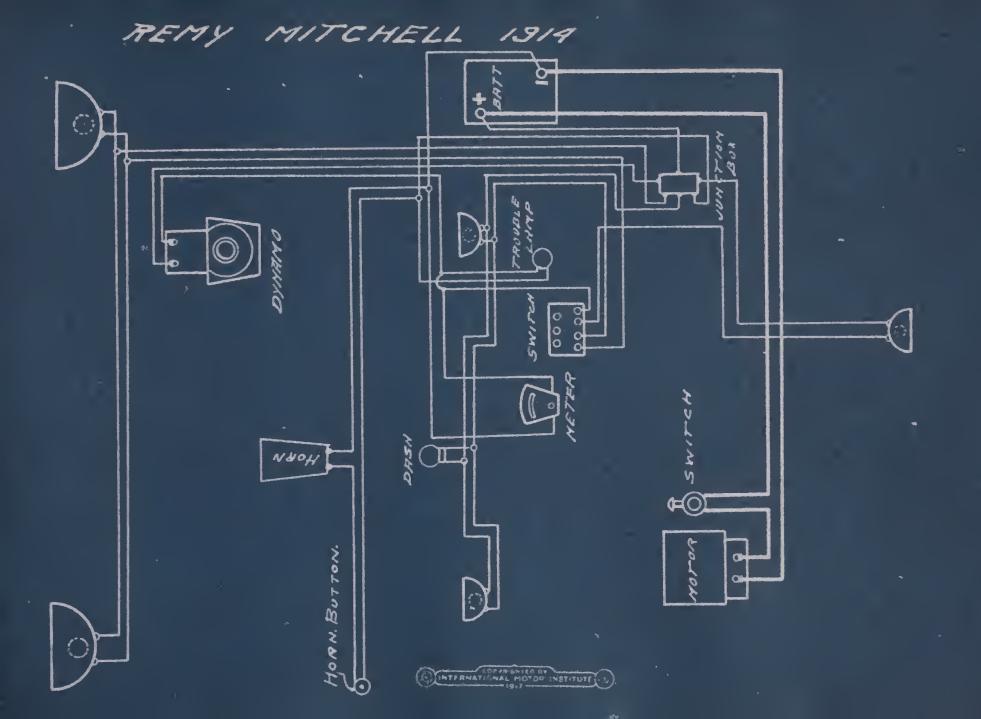
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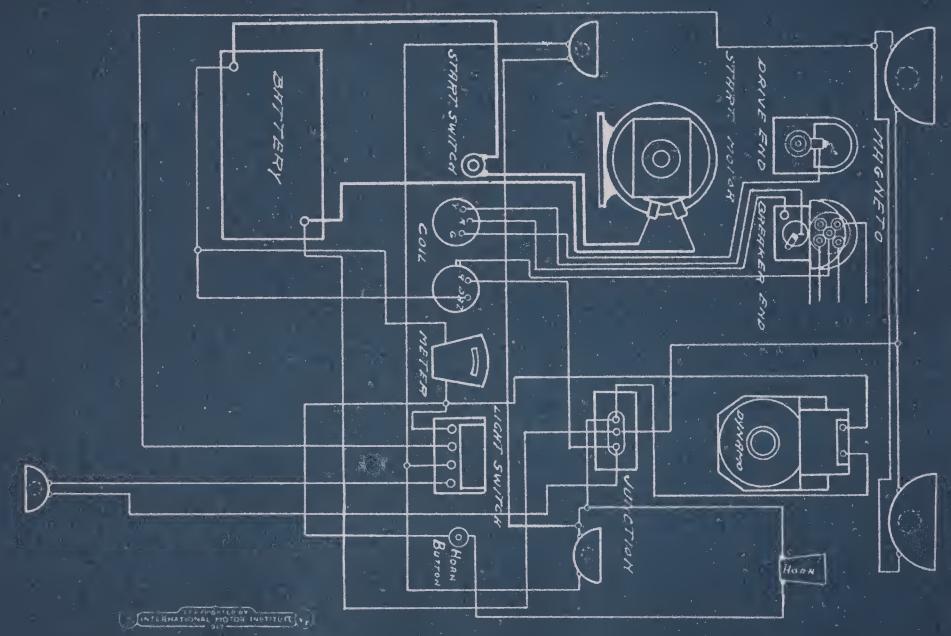


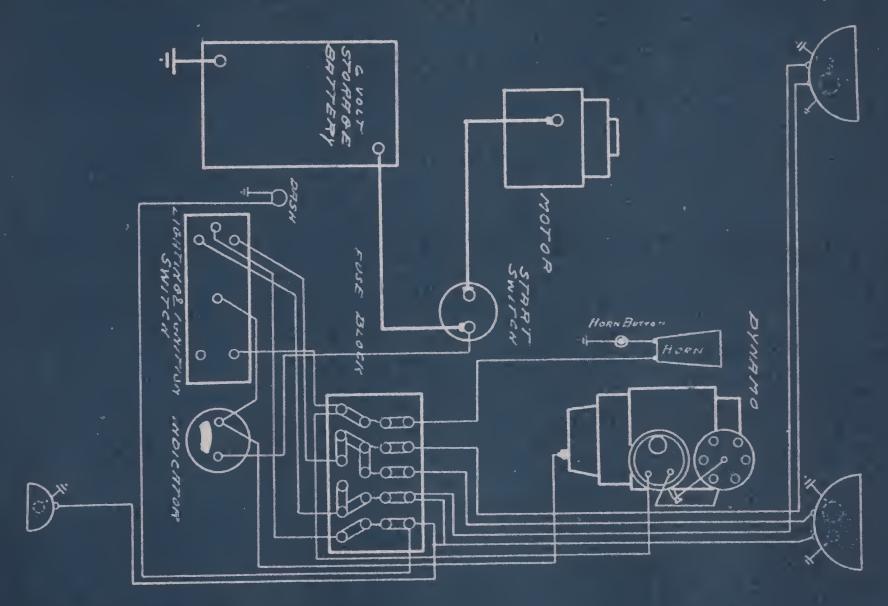


TINTERHAT DINAL MOSTAL INSTITUTE

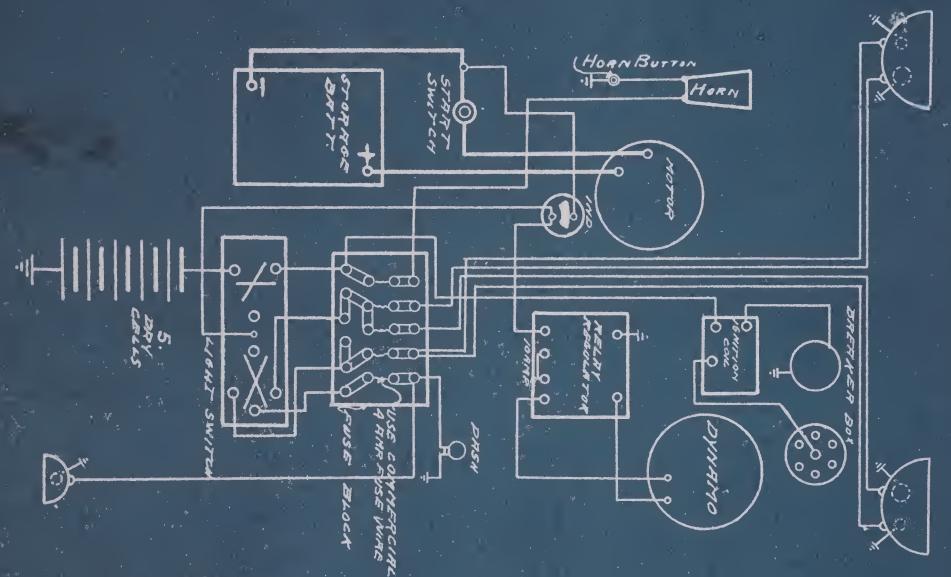


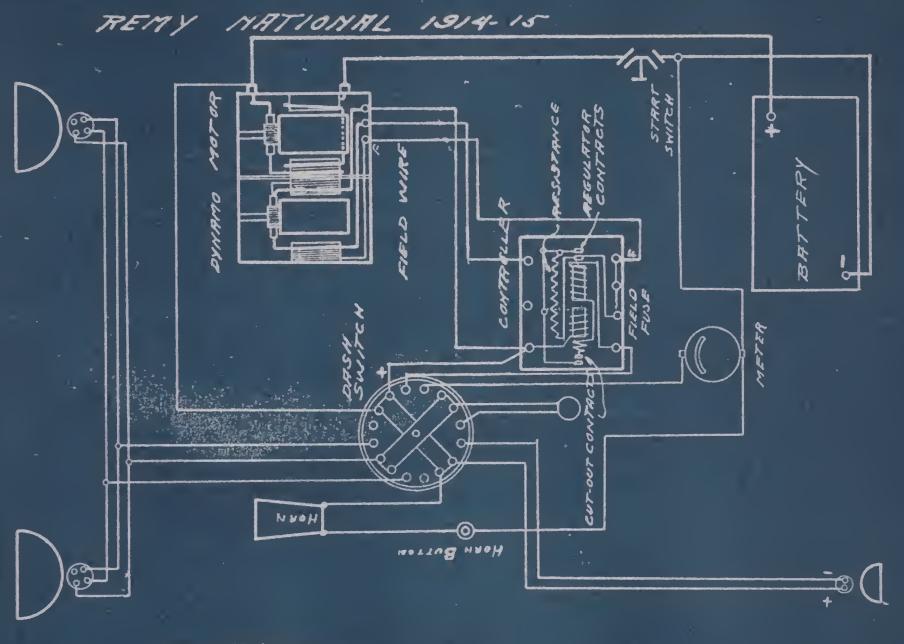
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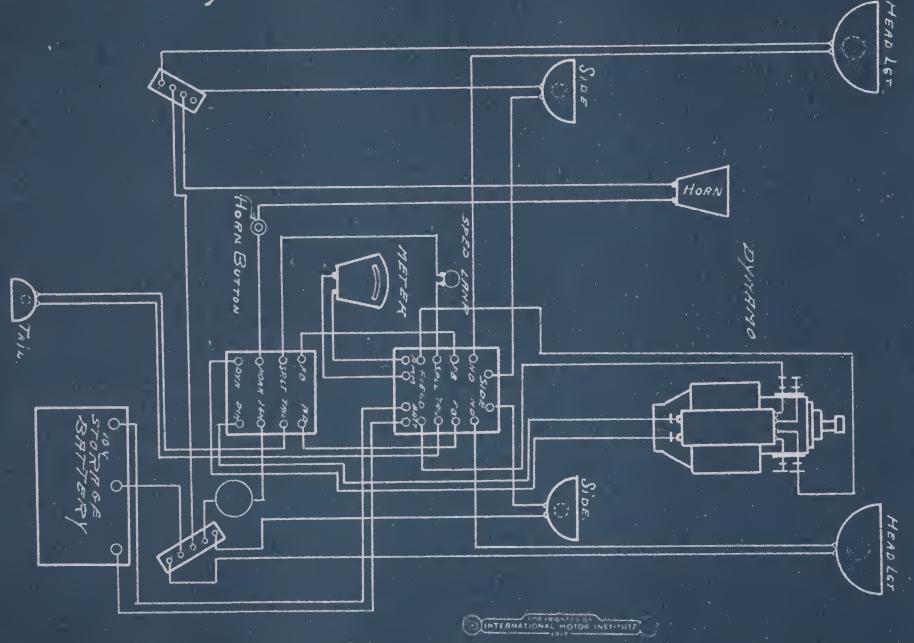


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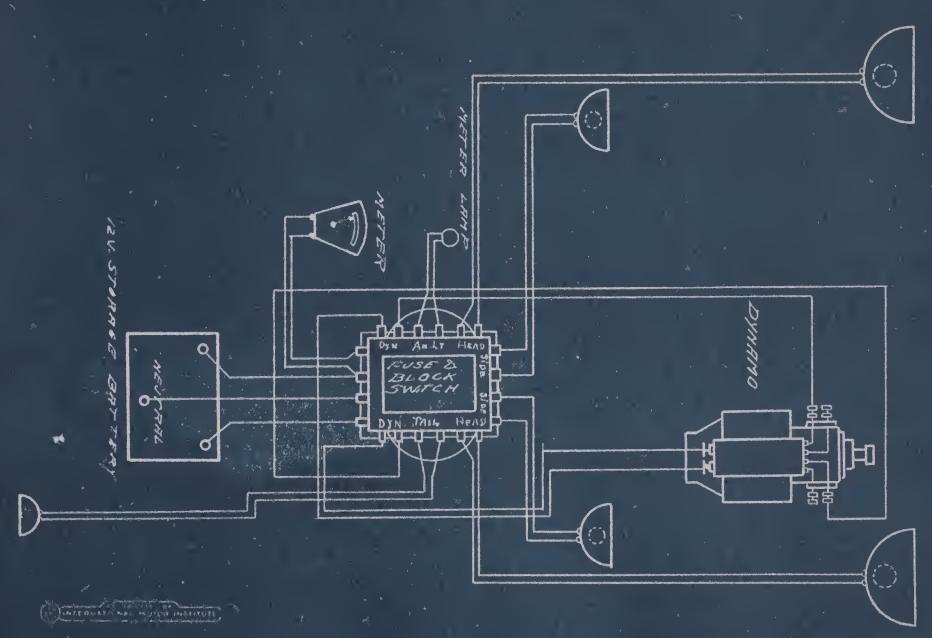




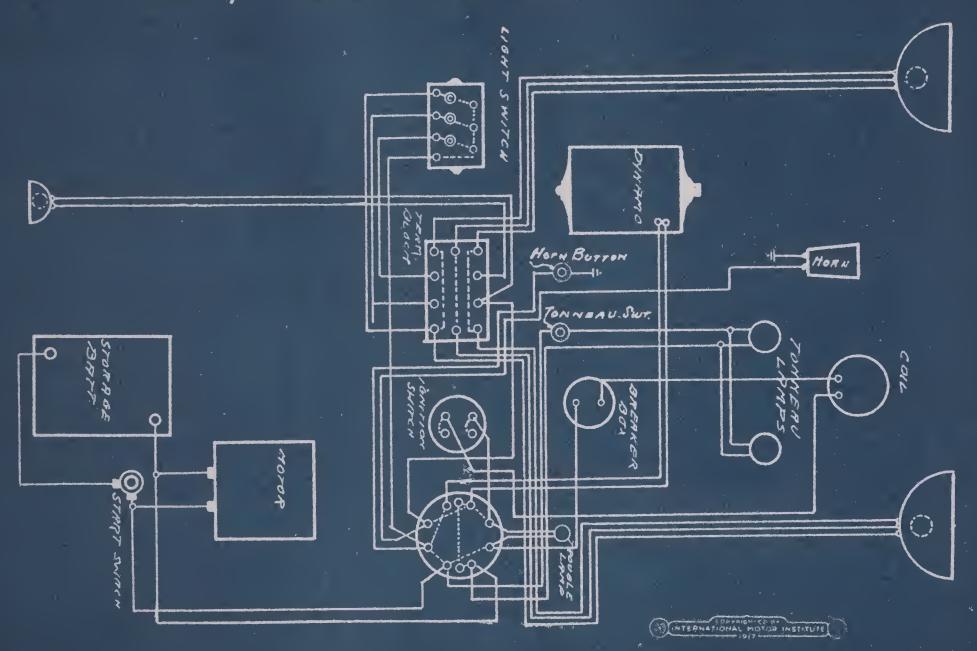
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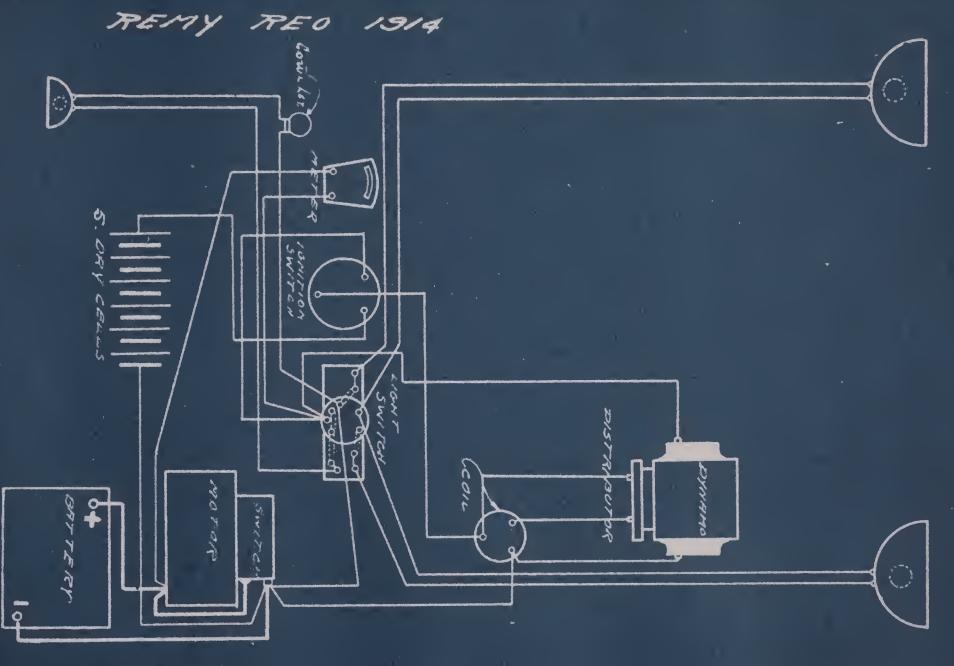


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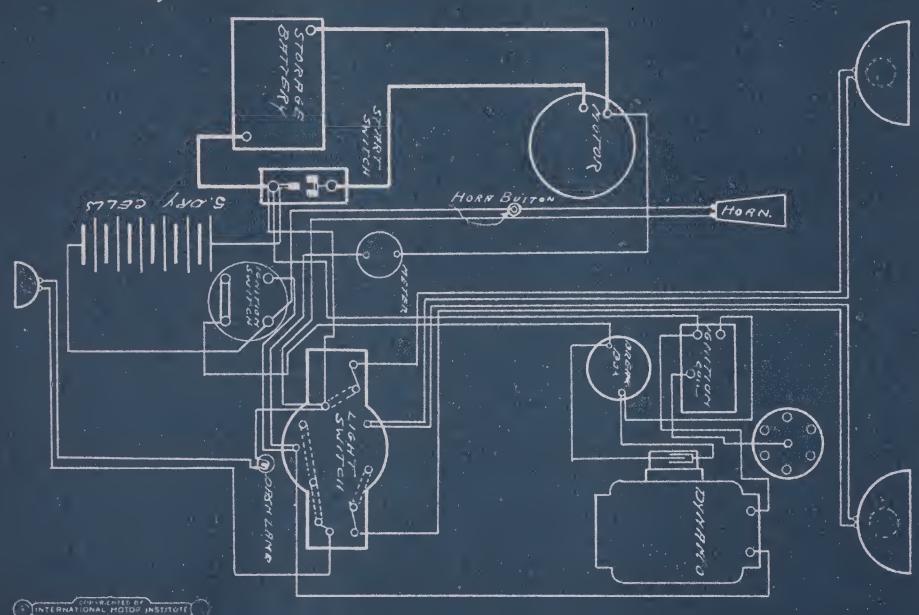
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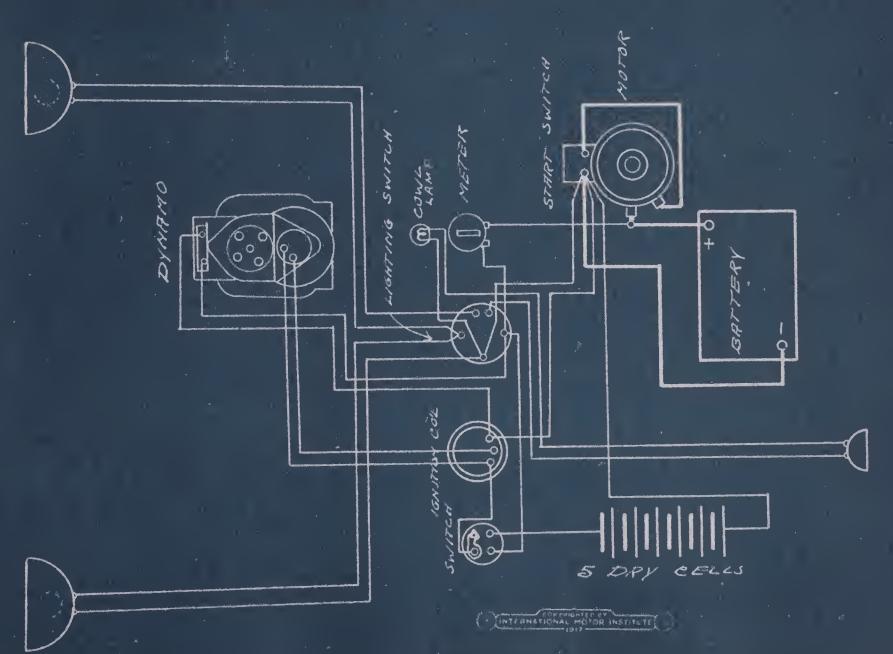


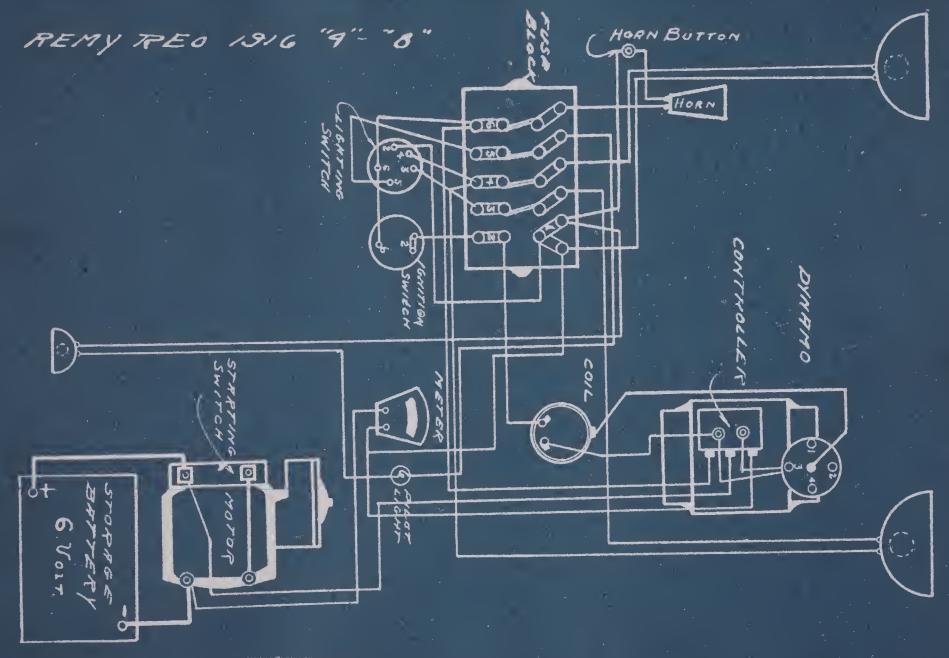


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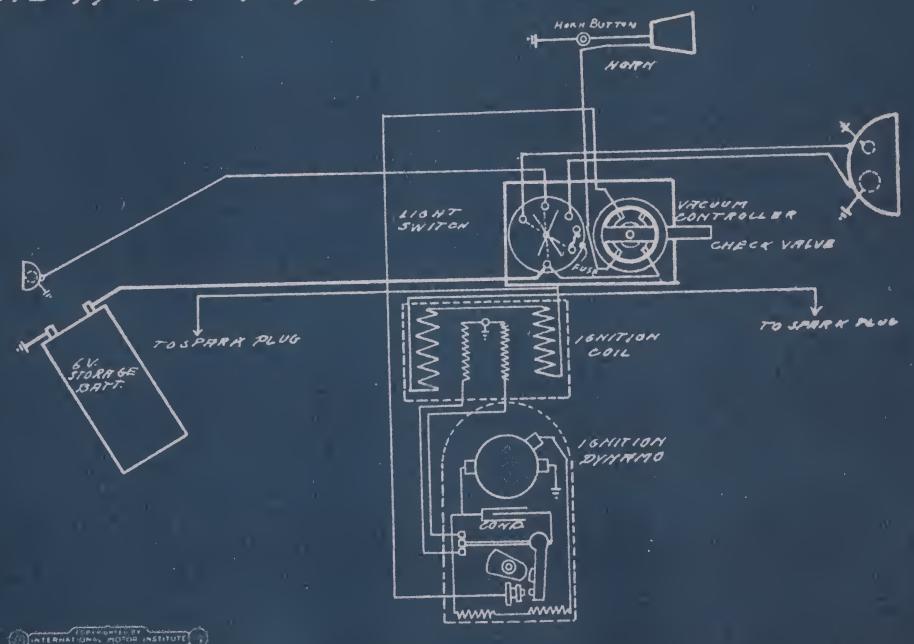
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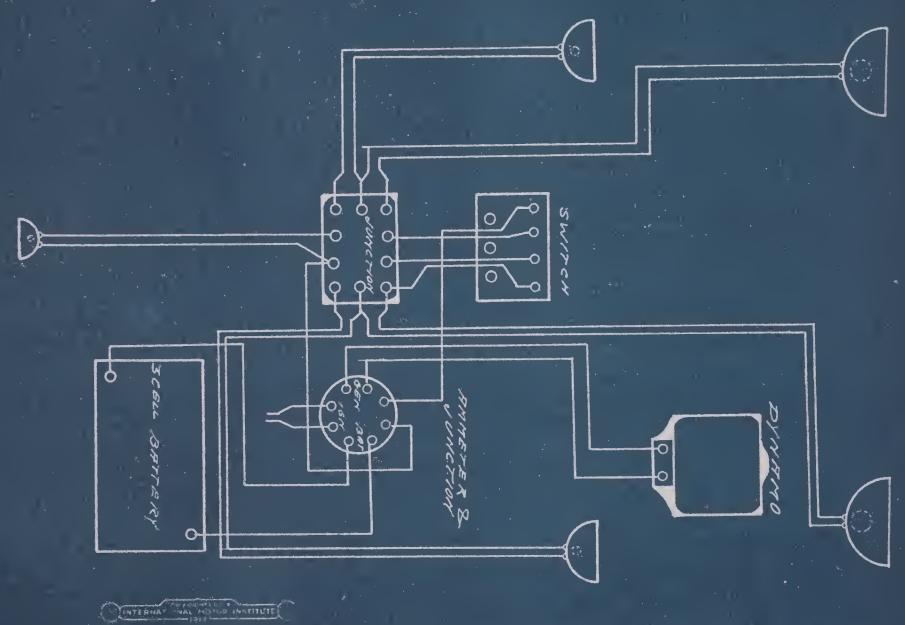


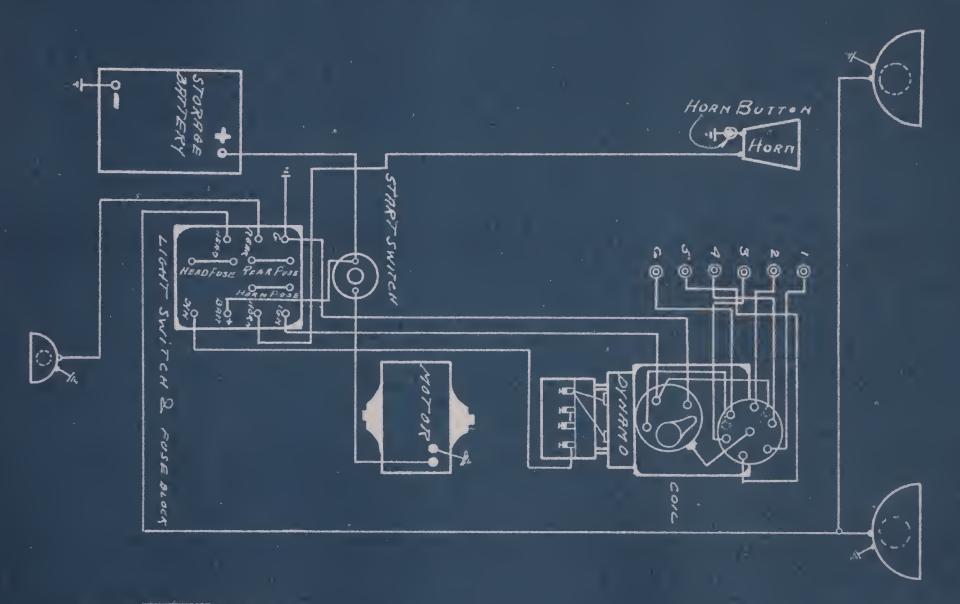


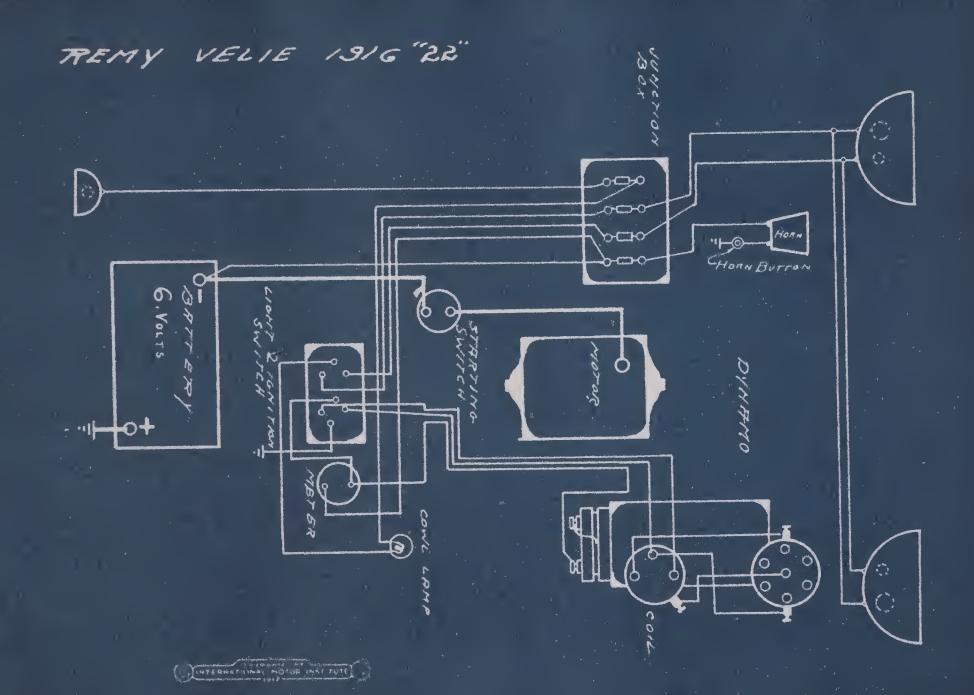


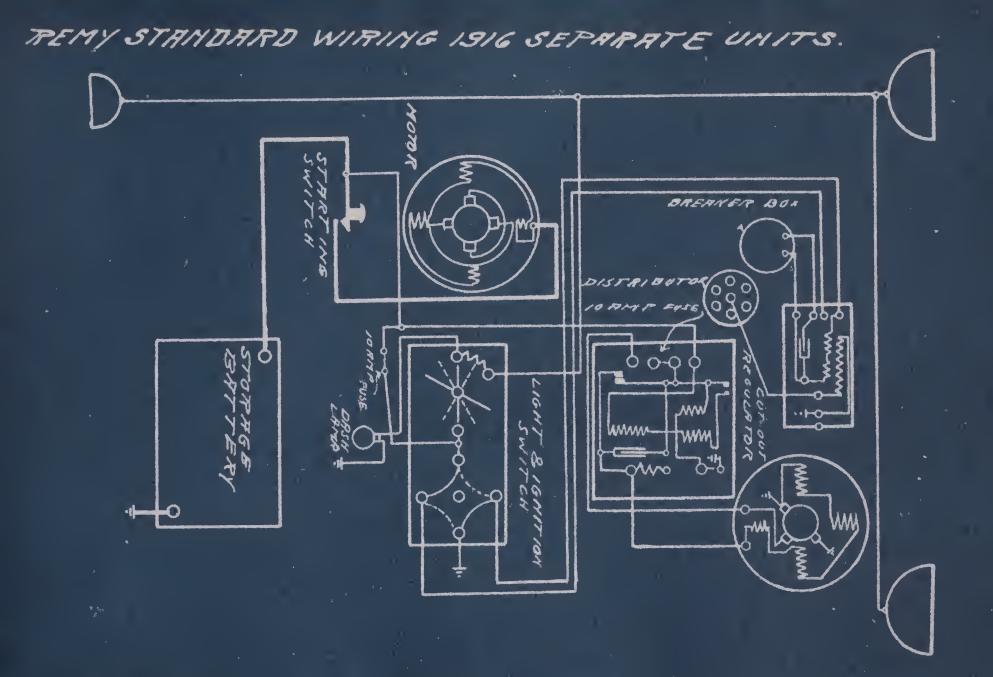
TREMY MOTOR CYCLE MODEL 15

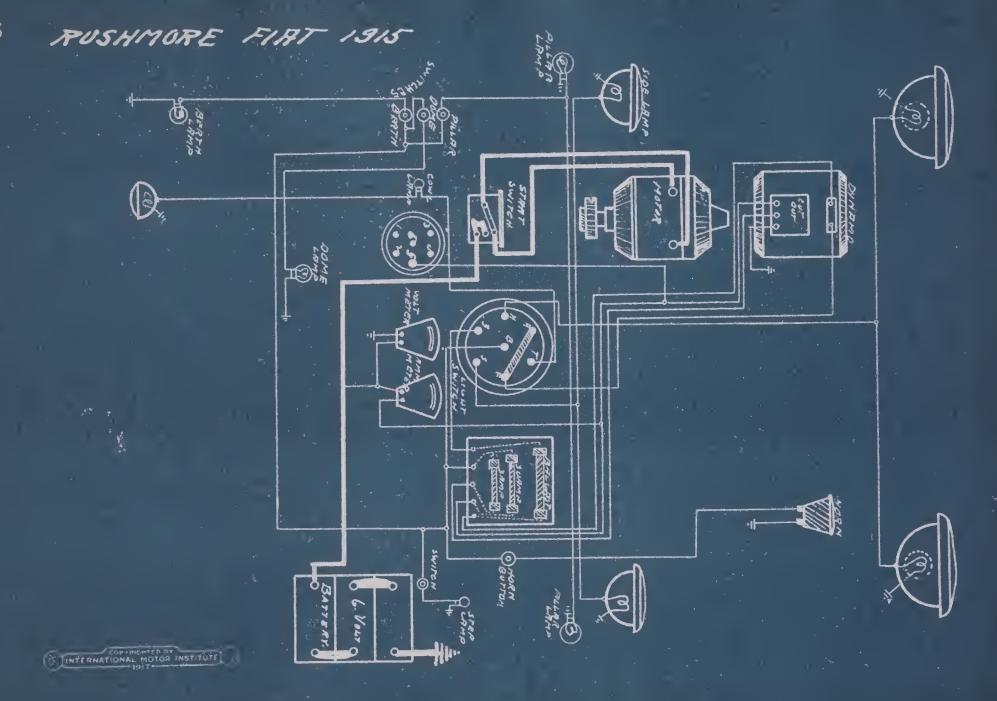


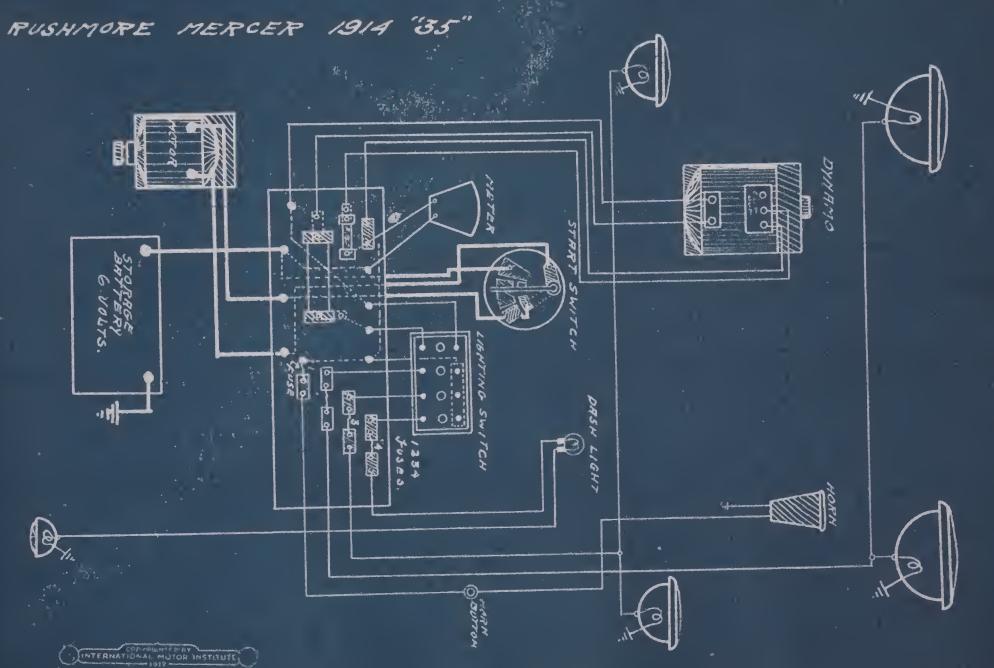


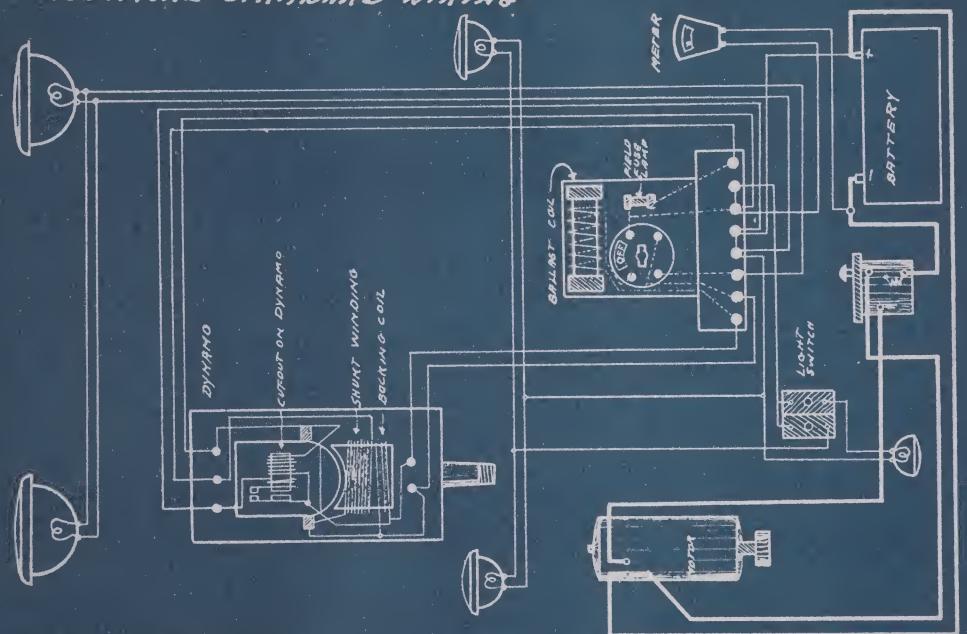


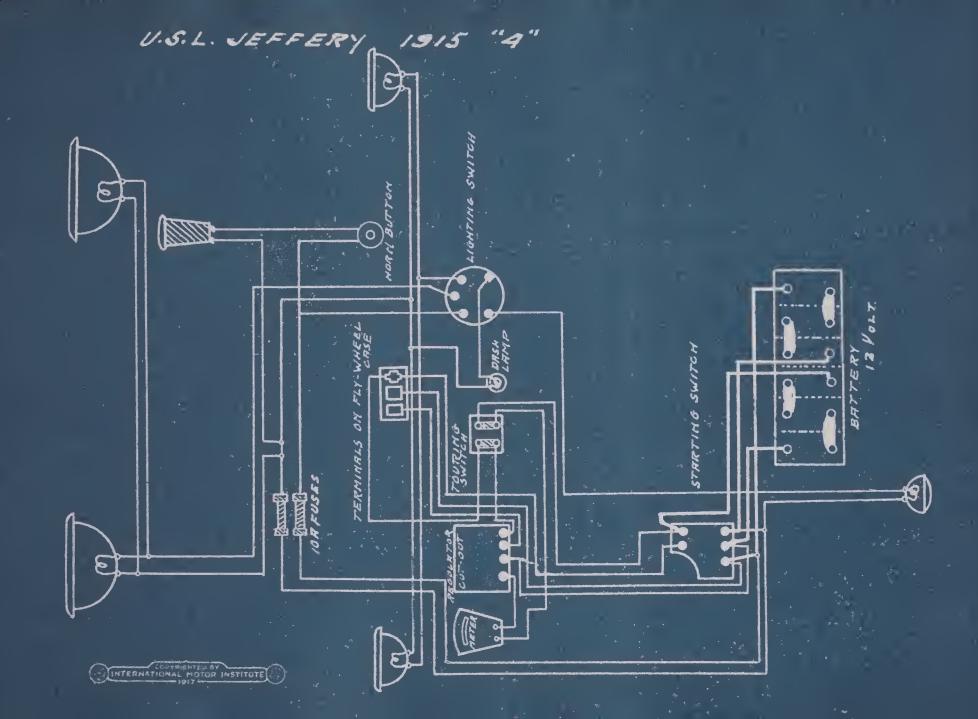


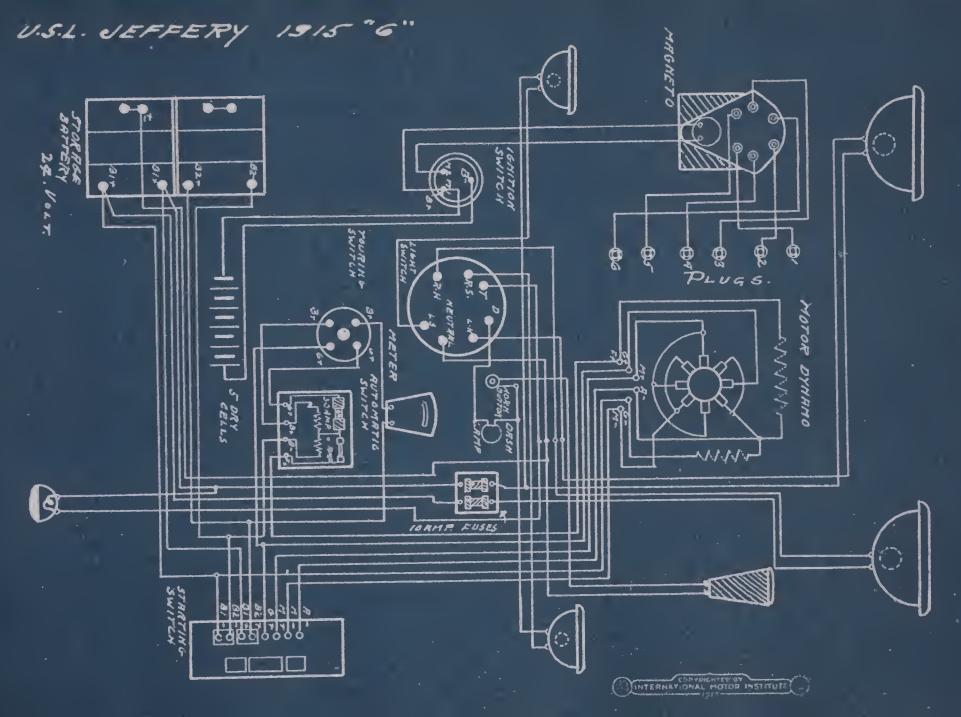


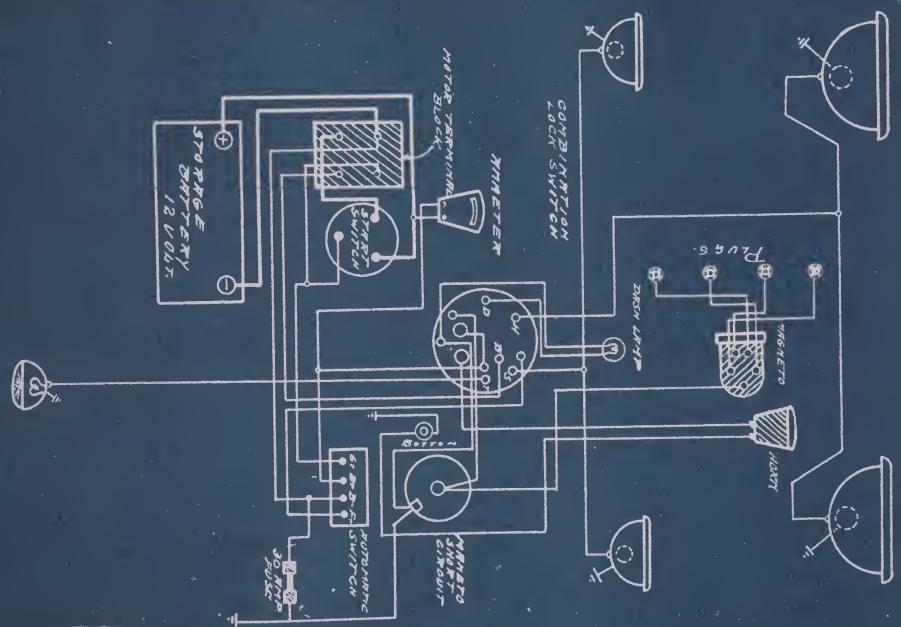




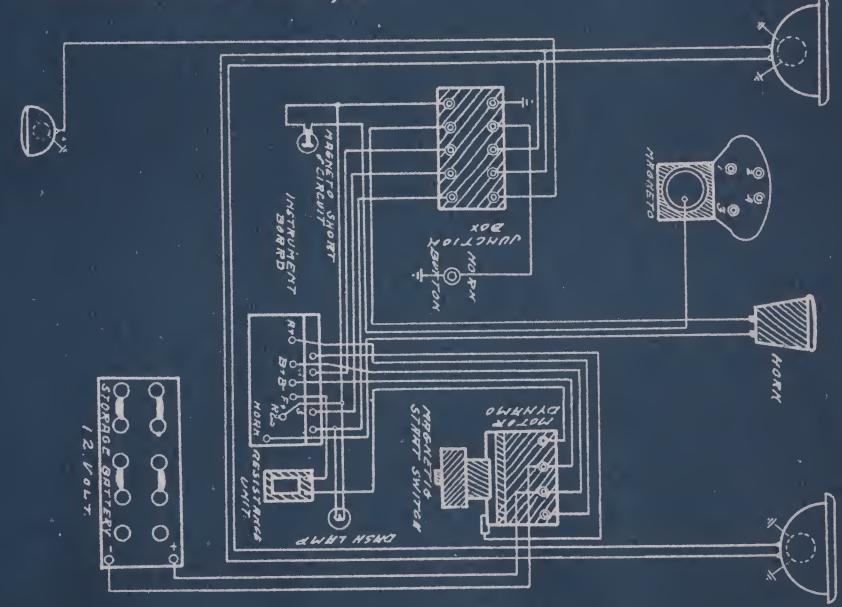


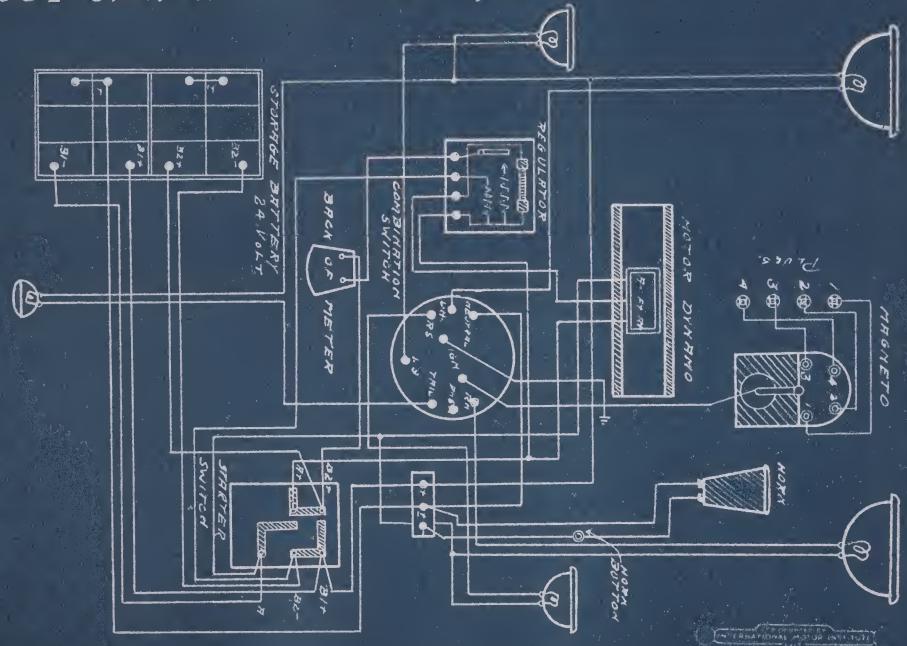


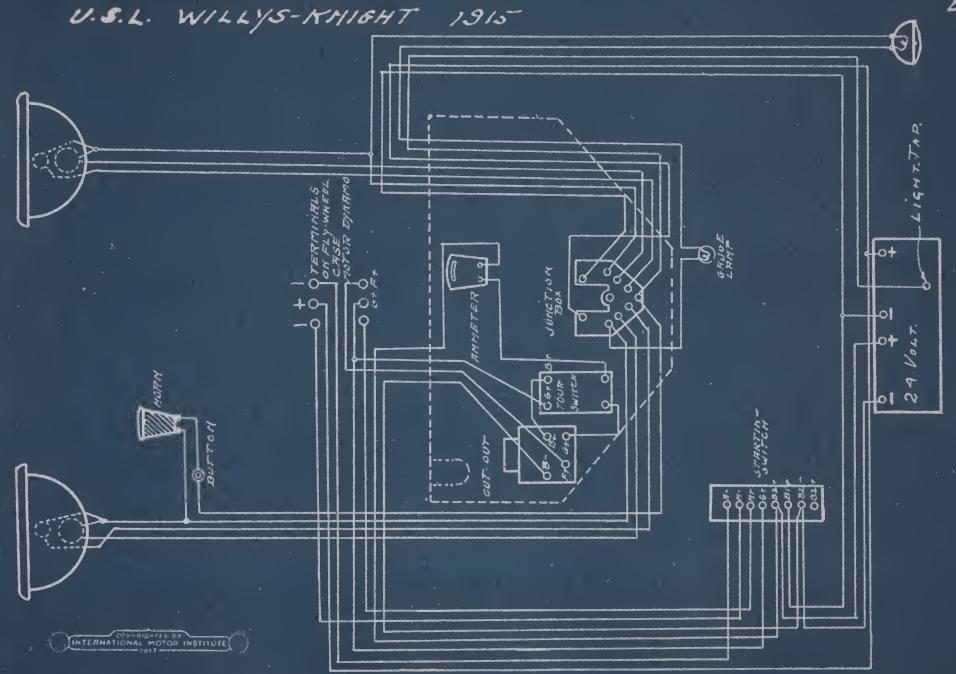


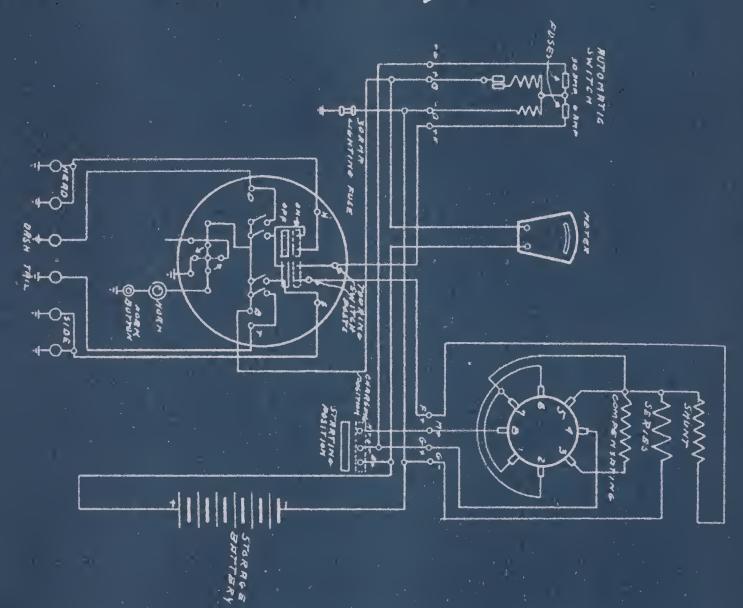


U.S.L. MERCER 1916 "ZZ-78"

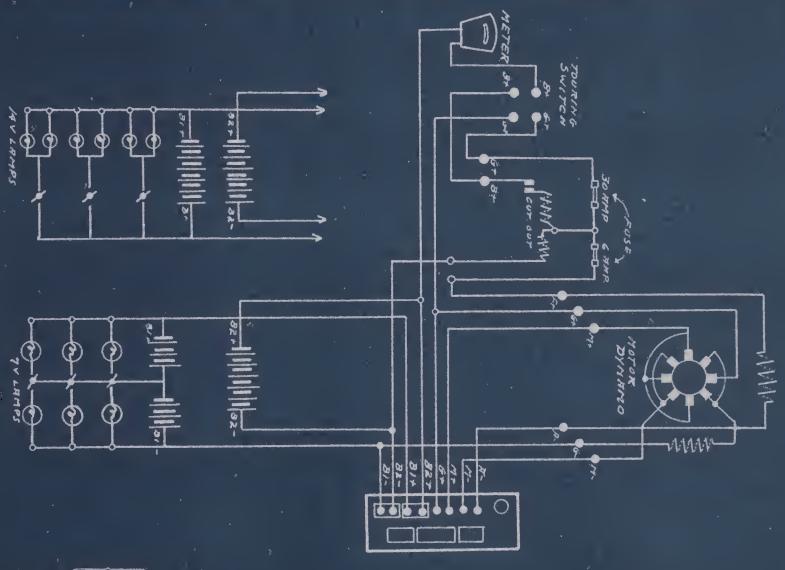




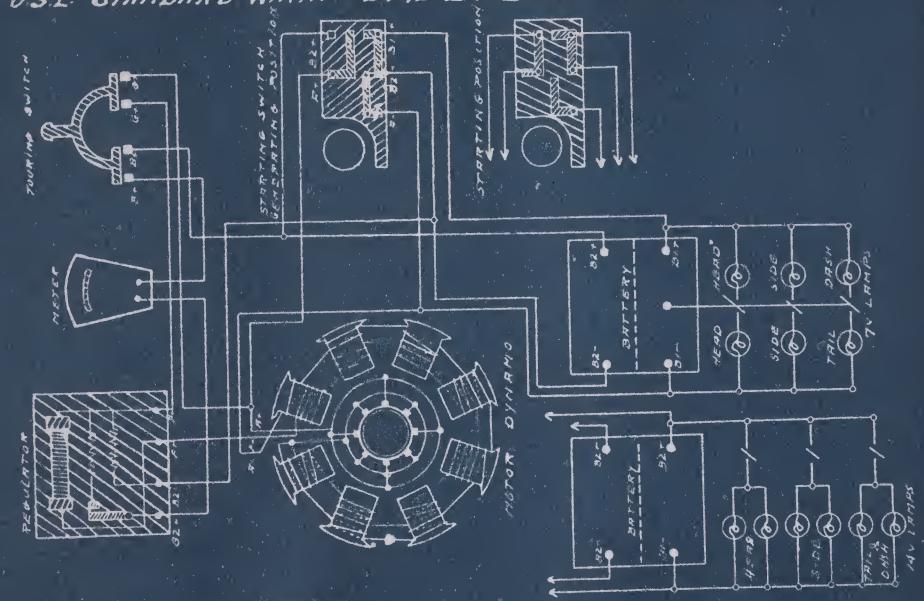




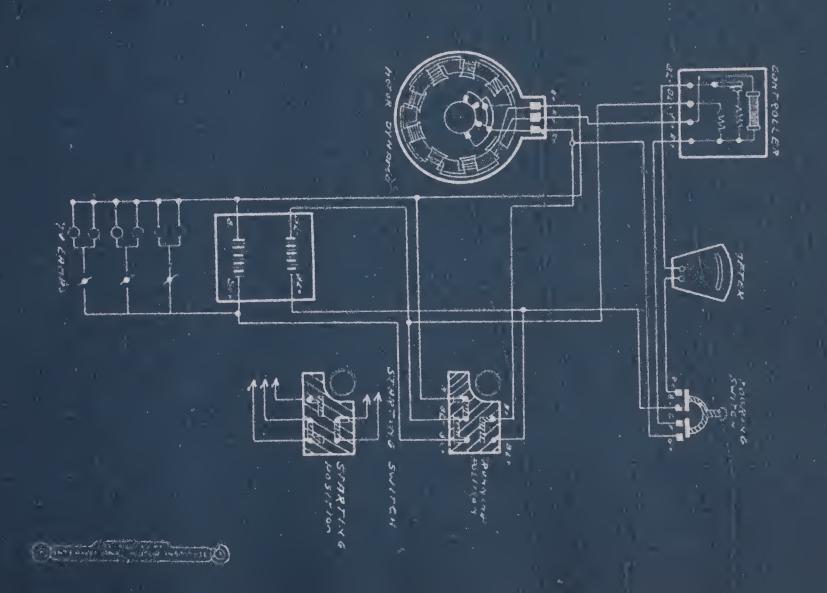
U.S.L. STANDARD WIRING 1915 INHERENT REGULATION.

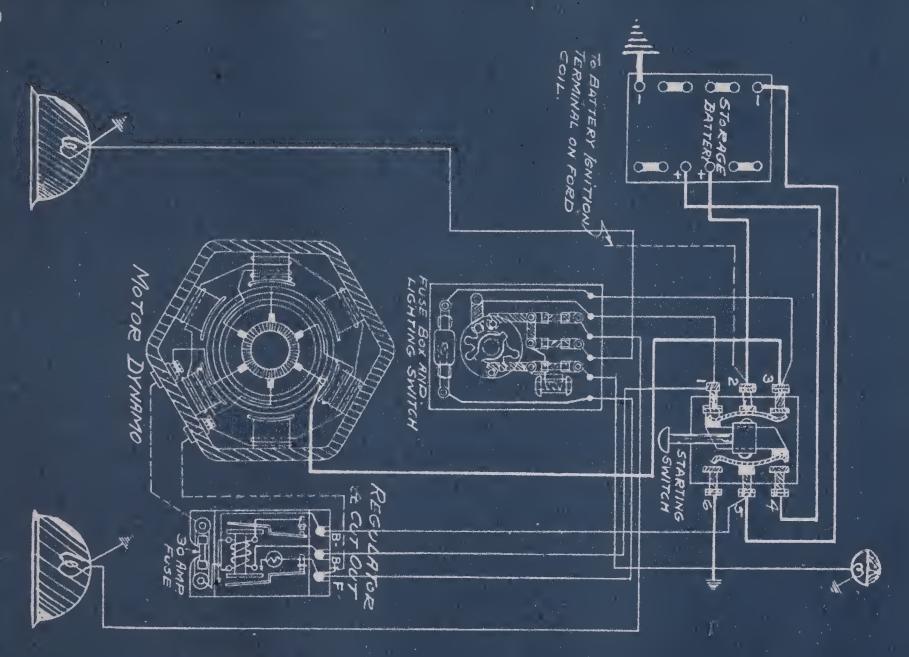


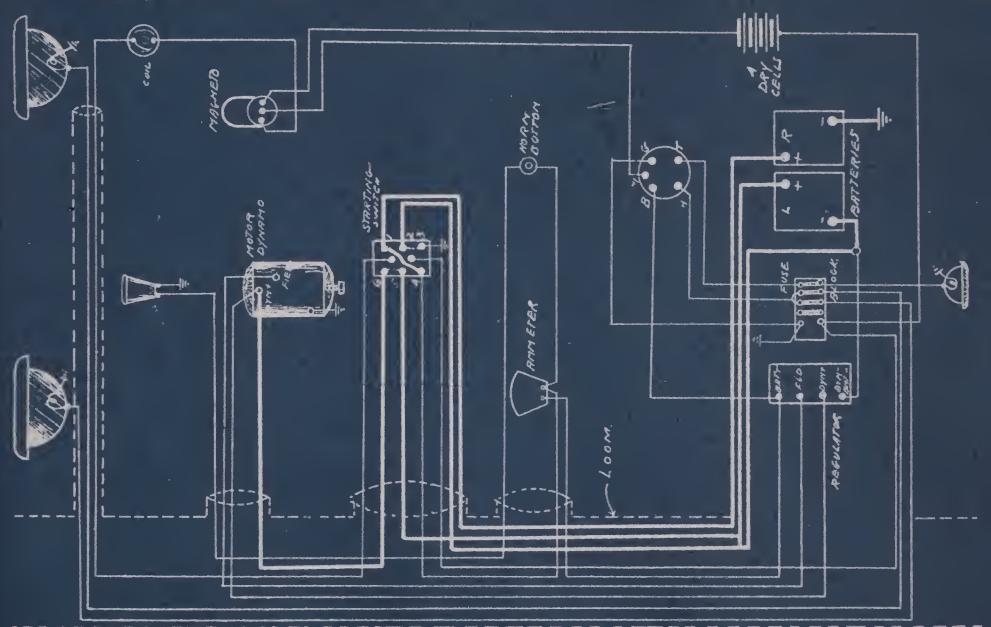
U.S.L. STANDARD WIRING 24-12 EXTERNAL REGULATOR

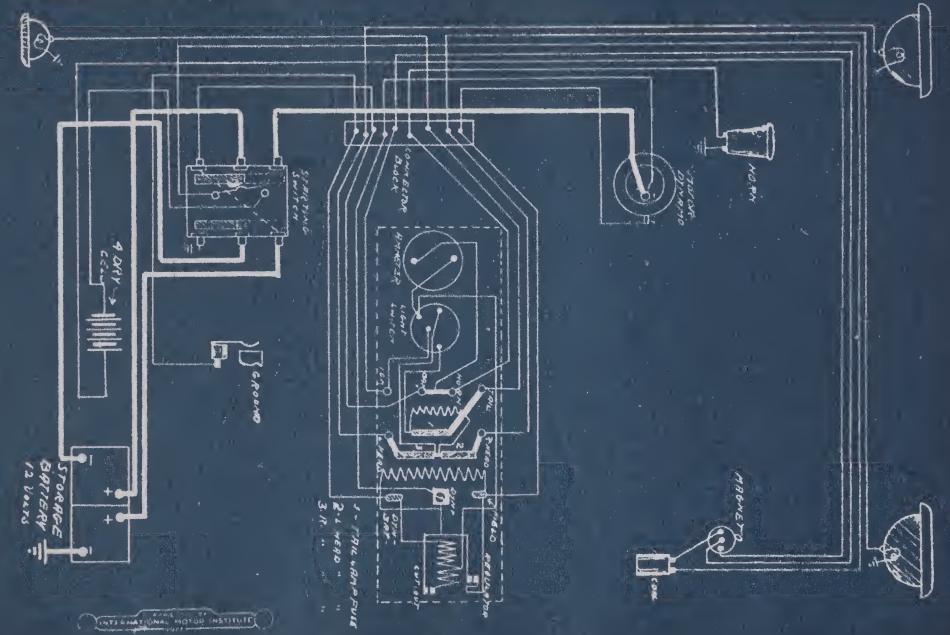


USL STANDARD WIRING EXTERNAL REGULATOR

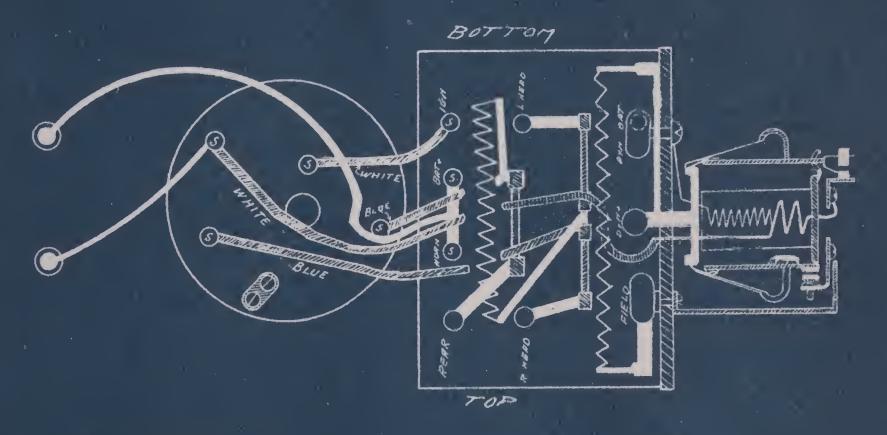


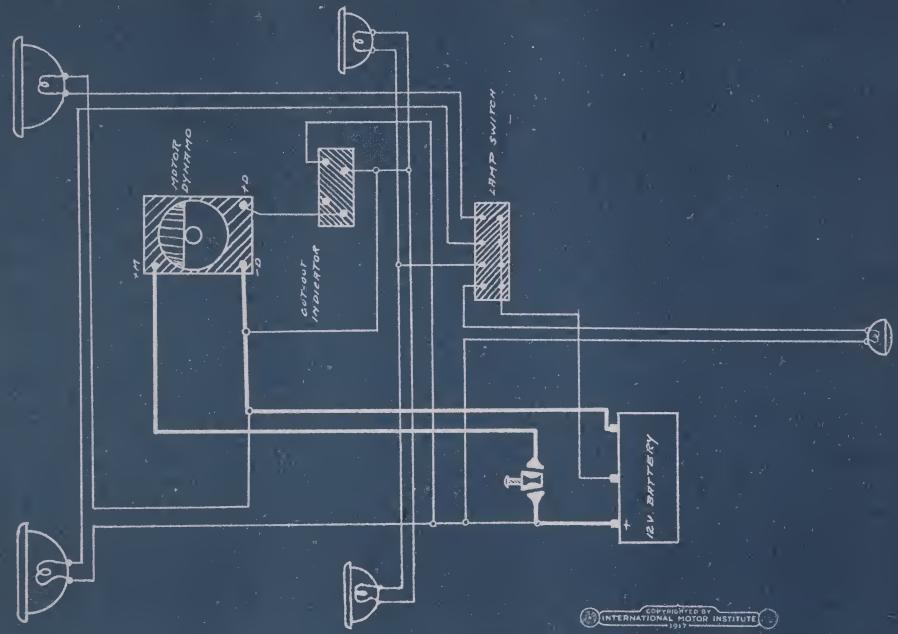


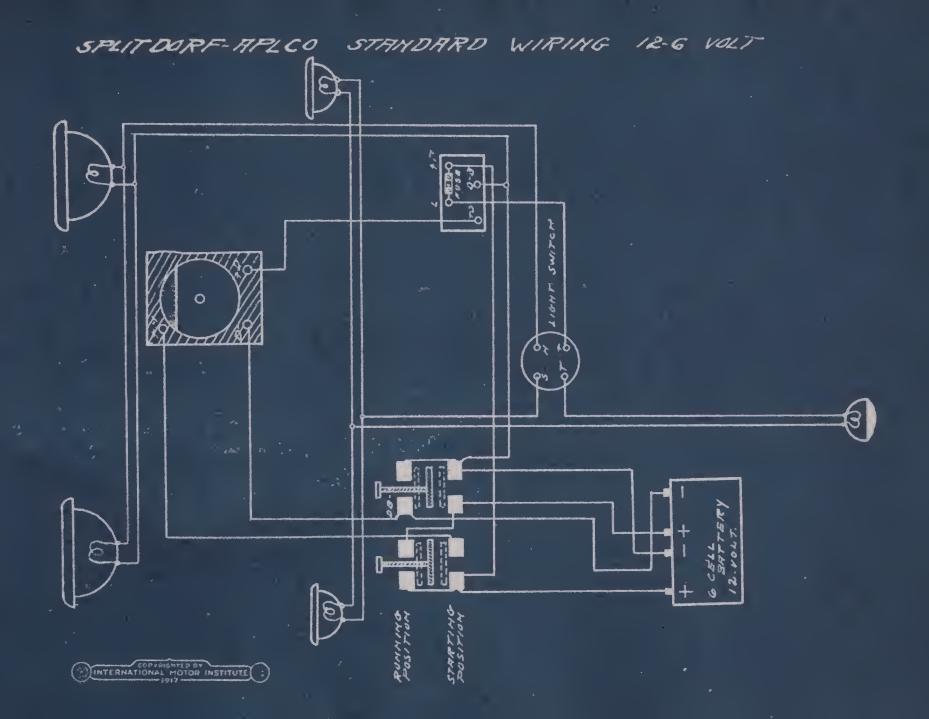




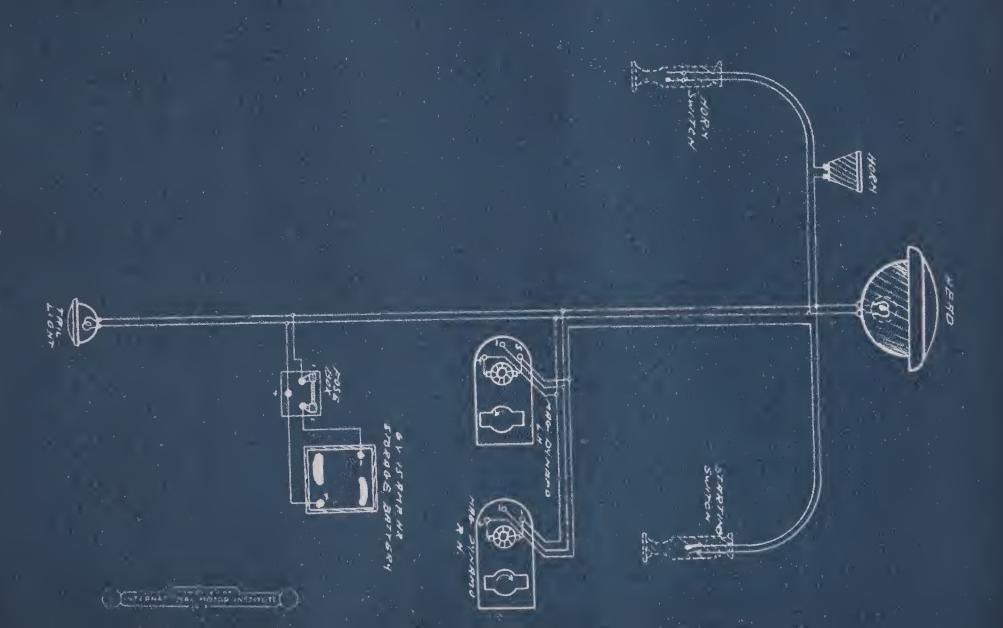
SIMMS HUFF MAXWELL 1916 DASH UNIT CIRCUITS





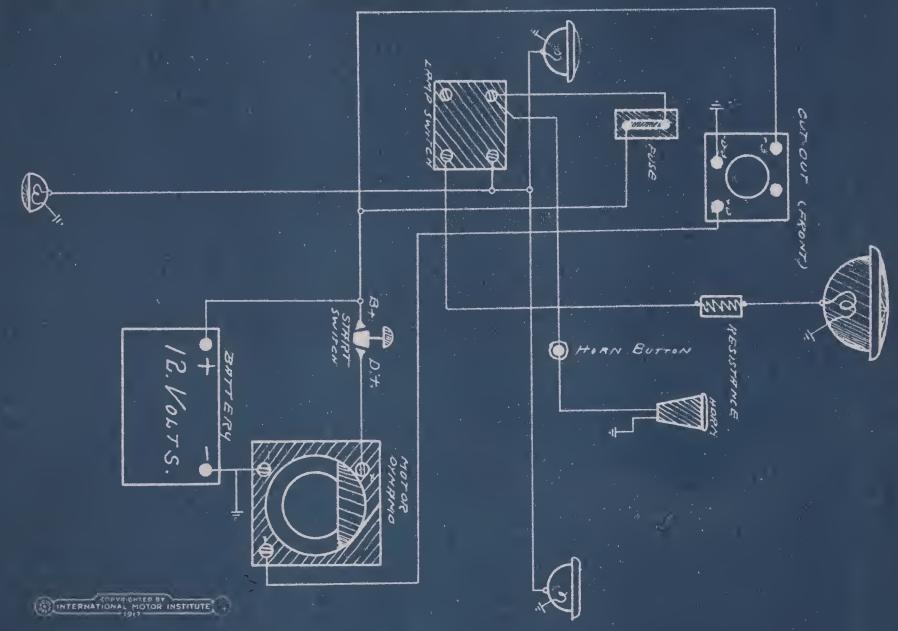


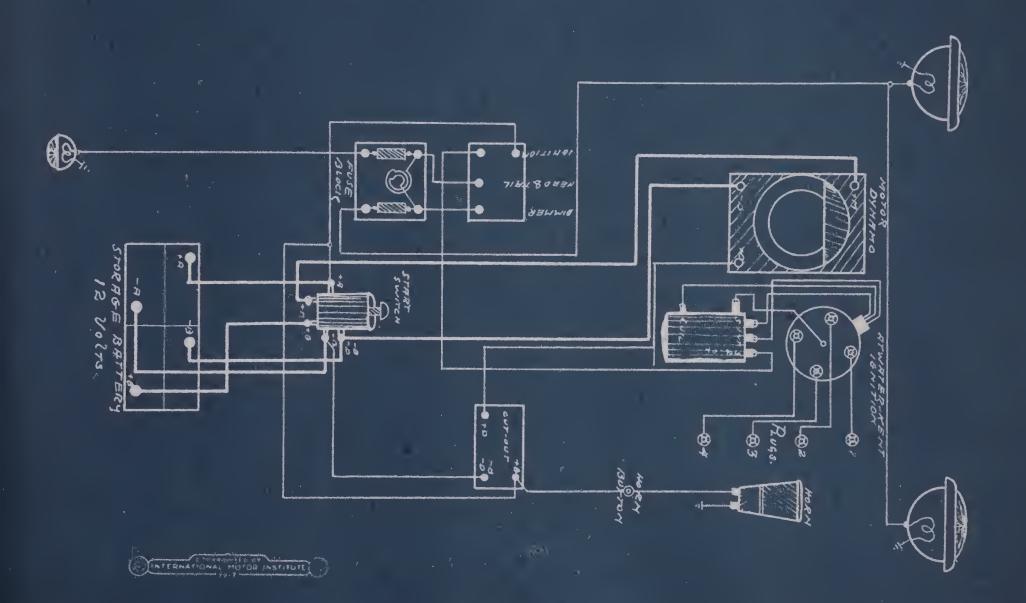
SPLITDORF MAG DYNAMO MOTORCYCLE

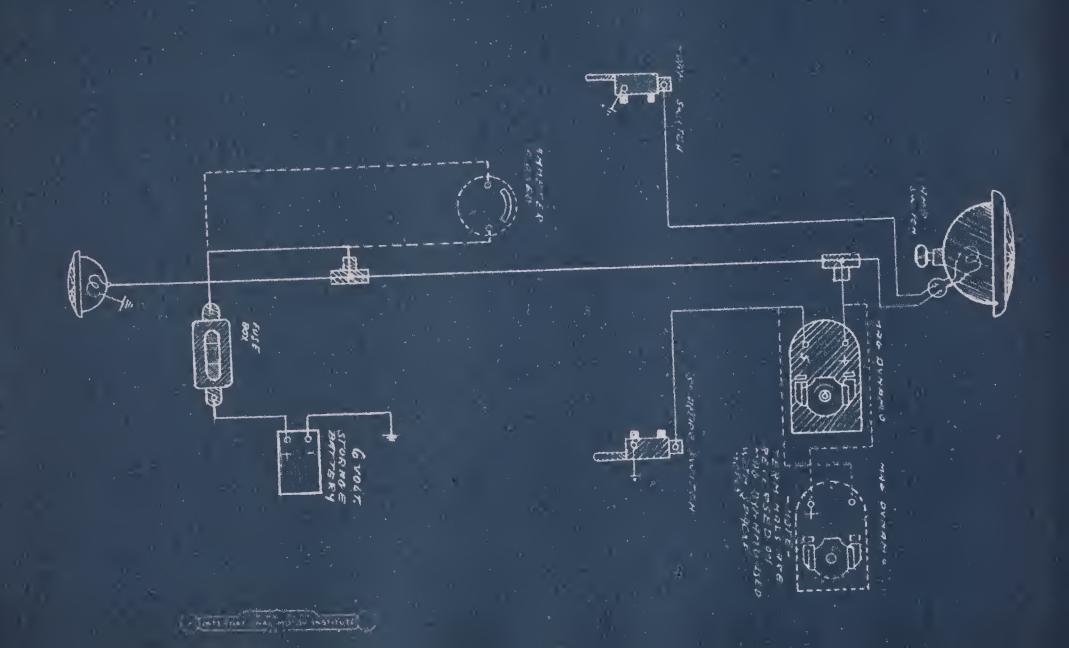


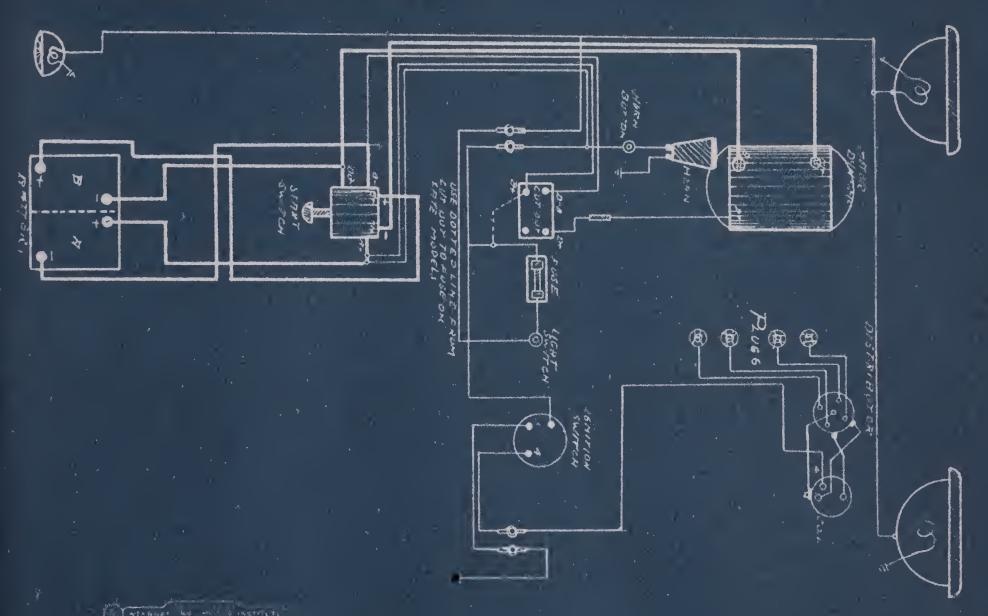
SFXIT DORF MAG DYMAMO INTERNAL OBVERNOR GOVERNOR CONFORDELLE P CONTROLLER BARRERY BAT ERY EUX OUX Kith production B' NIGH SAEN D ON AN SERVED LAMPS V TO CONTROL OF THE PARTY OF THE PARTY. Marin Minuter that the rolling START 6 STATT (\mathcal{S}) COIL STORAGE STORAGE DATTER BATTERY SHUMY CO LS SNUNT GULLS OUT SIDE SUPSIDE EYA ENO du cord or SWITCH Sm. ren di ours or INSIDE JUTSINE 78 8 O.B. END 600 CAPOUP TO BUT. TO CIRCUIT BREAKER DISTRIBUTOR DISTRIBUTOR BRUSH BRUSH LEFT MAND POTATION RIGHT HAND ROTATION

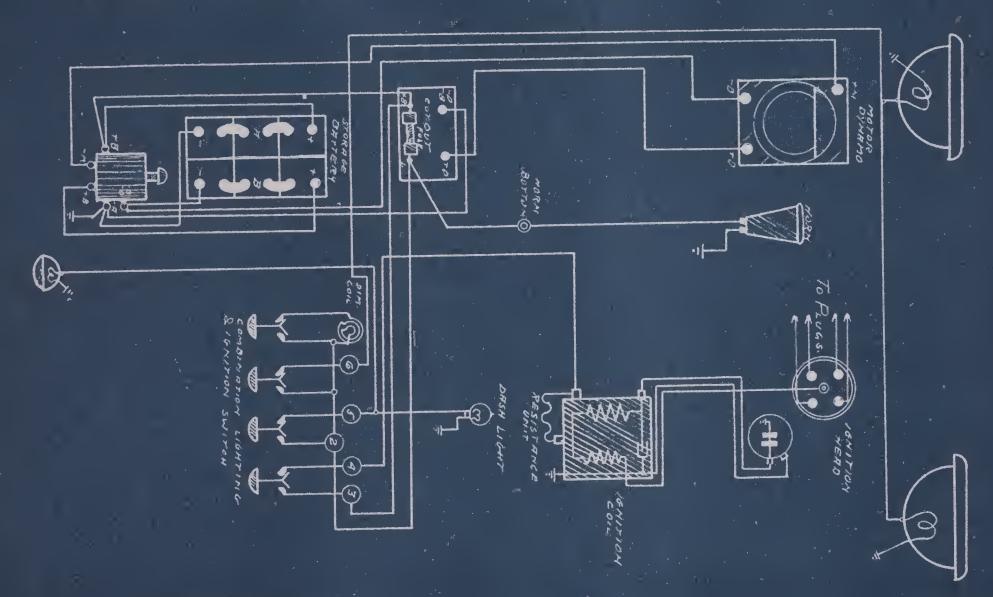
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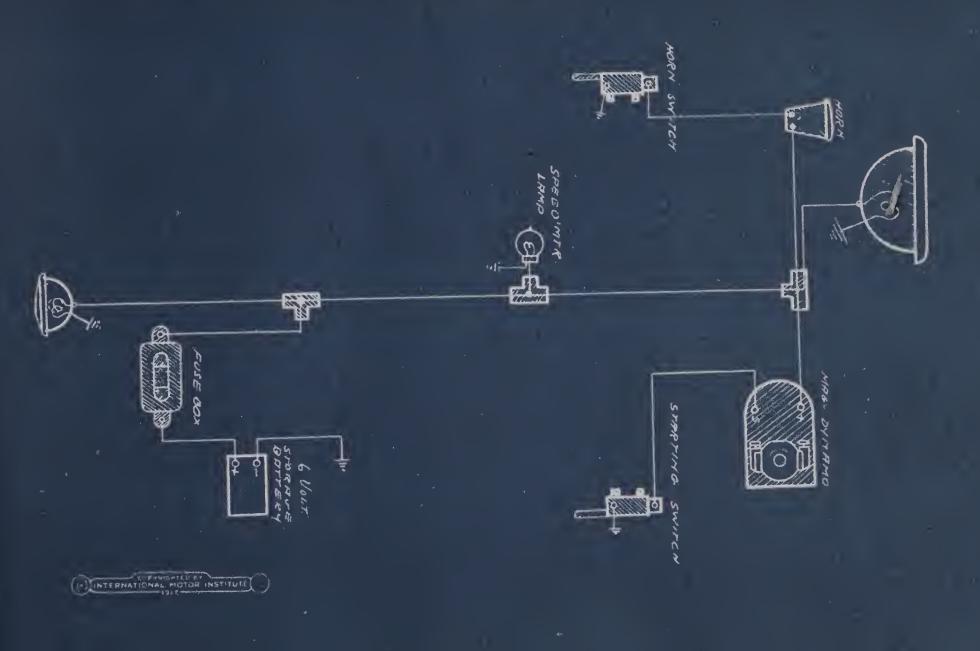


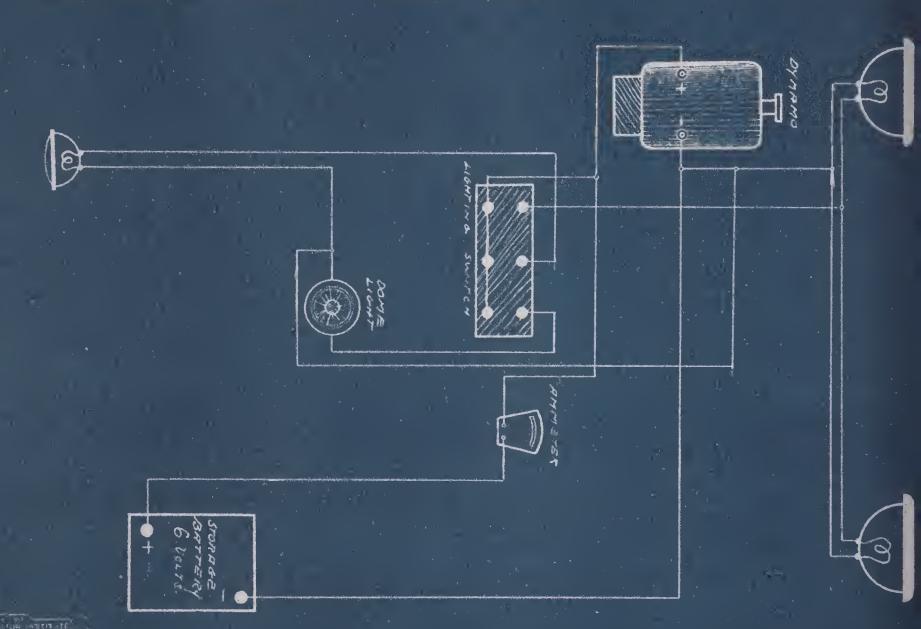


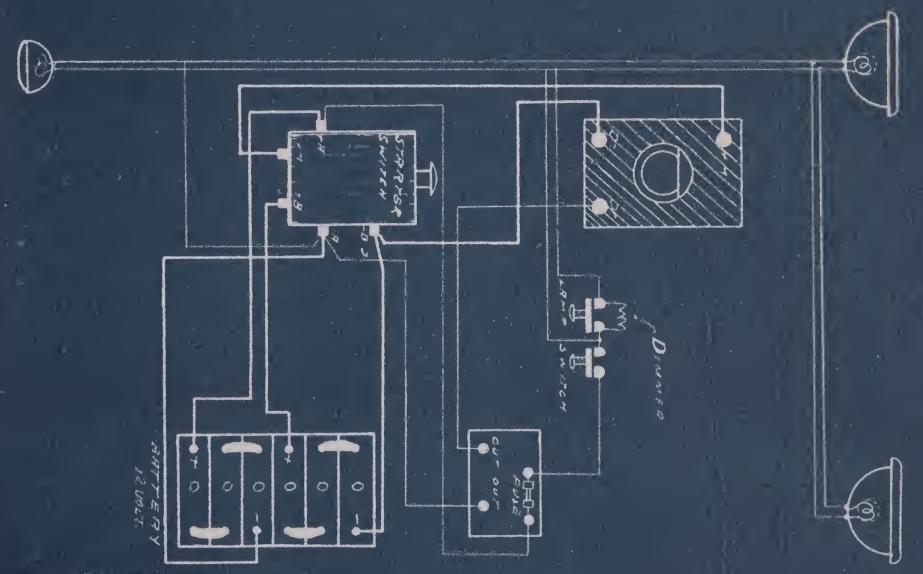




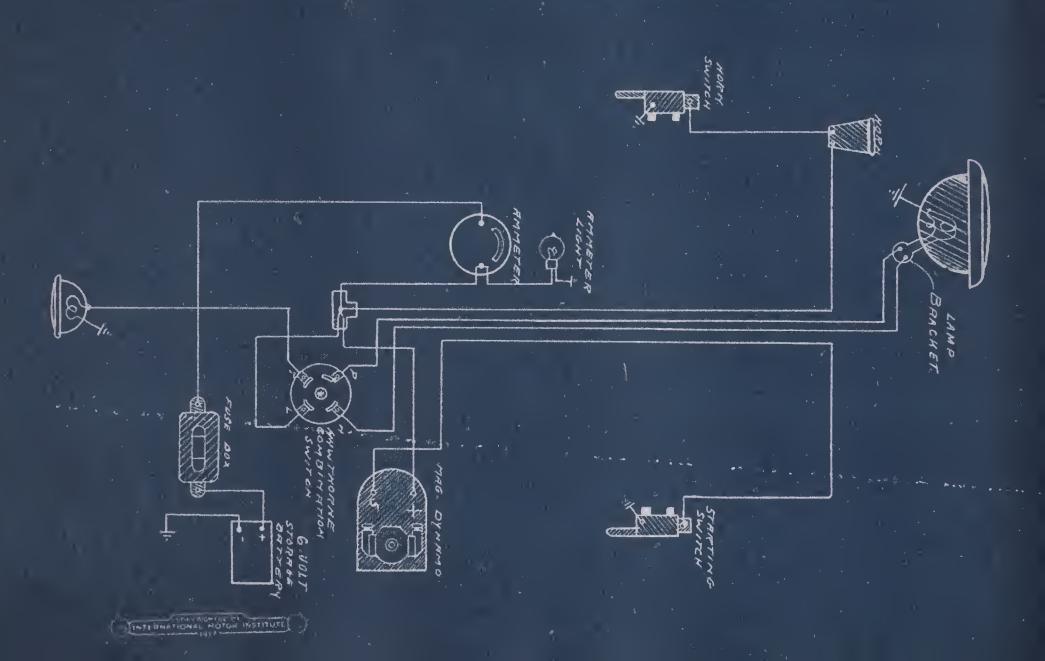
SPLITDORF EXCELSION MOTORCYCLE

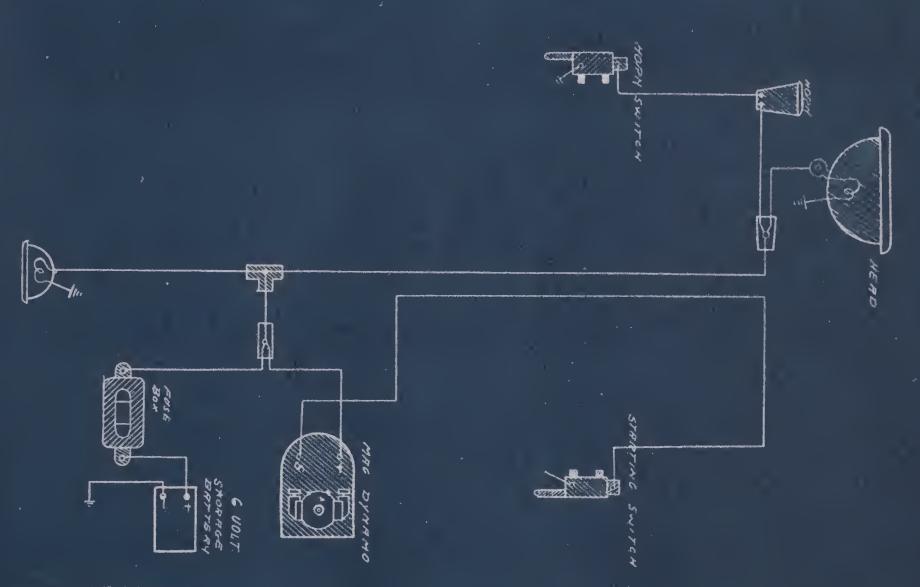


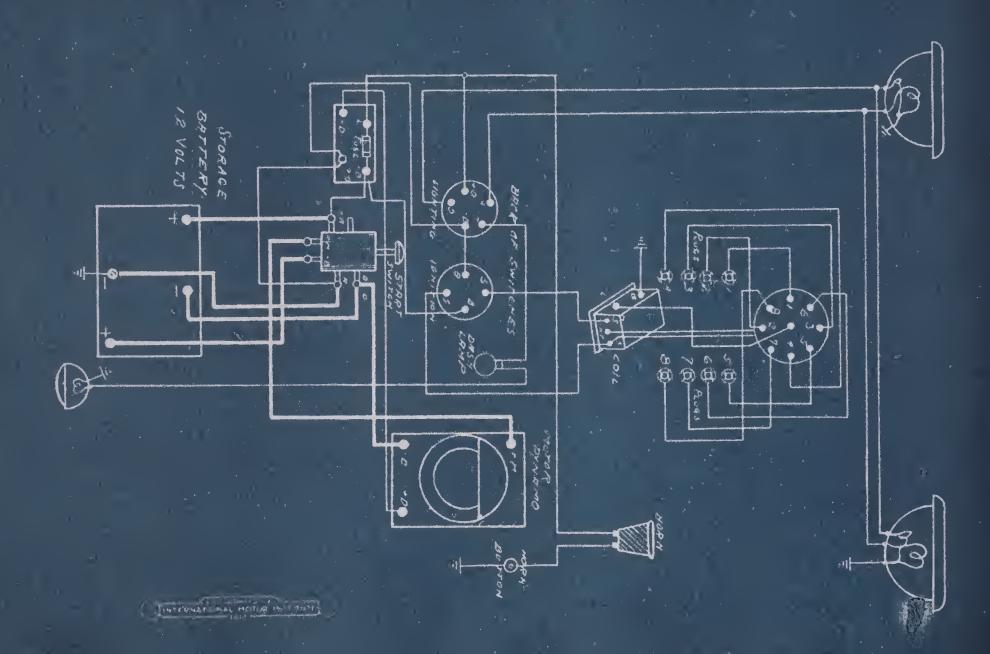




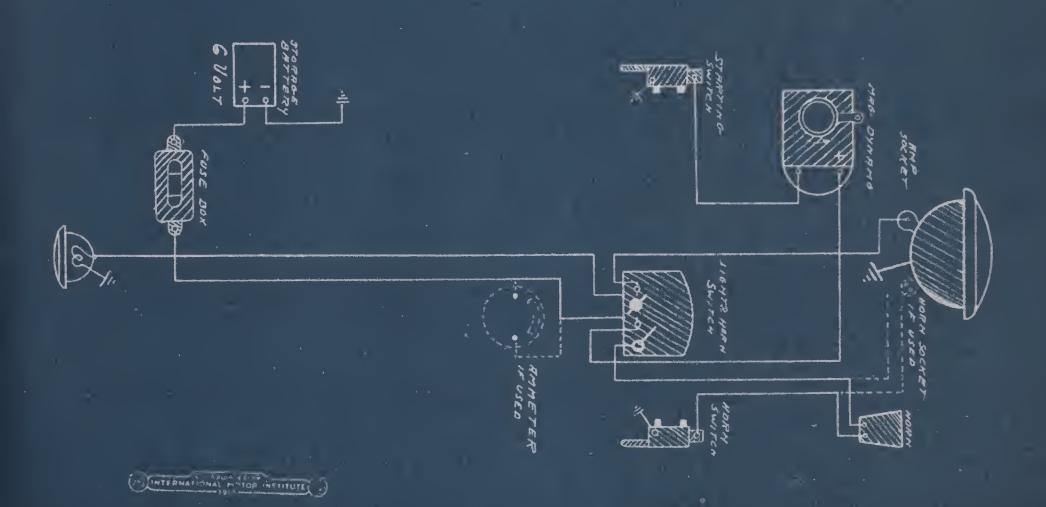
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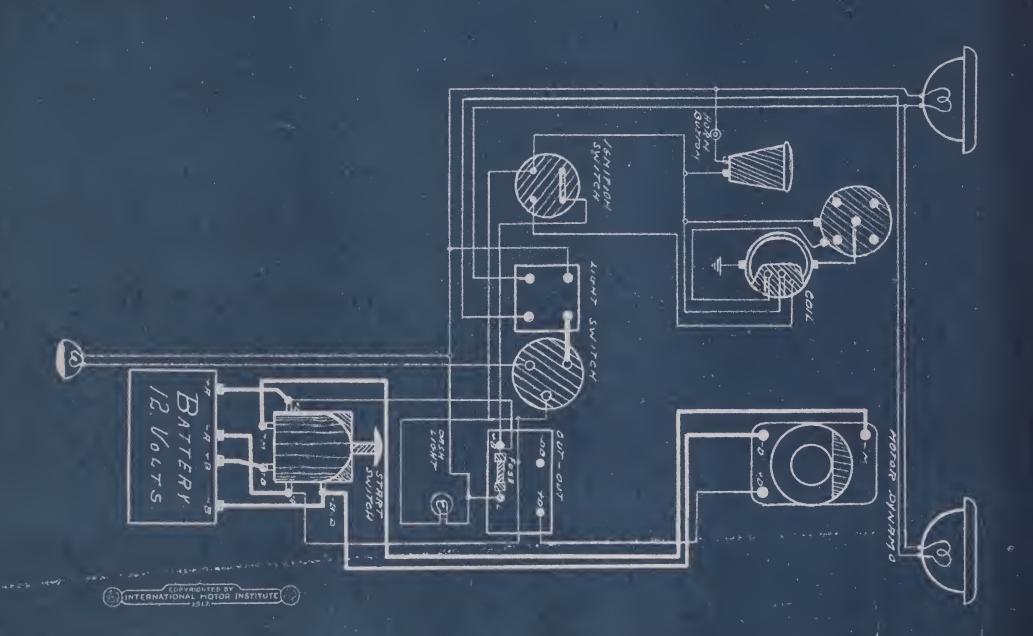


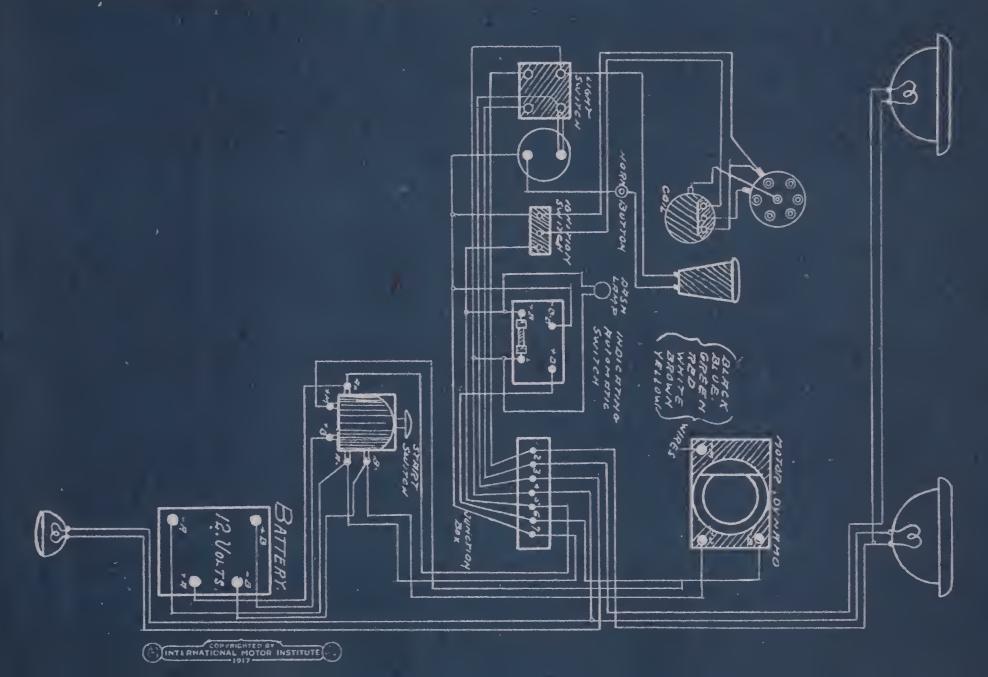


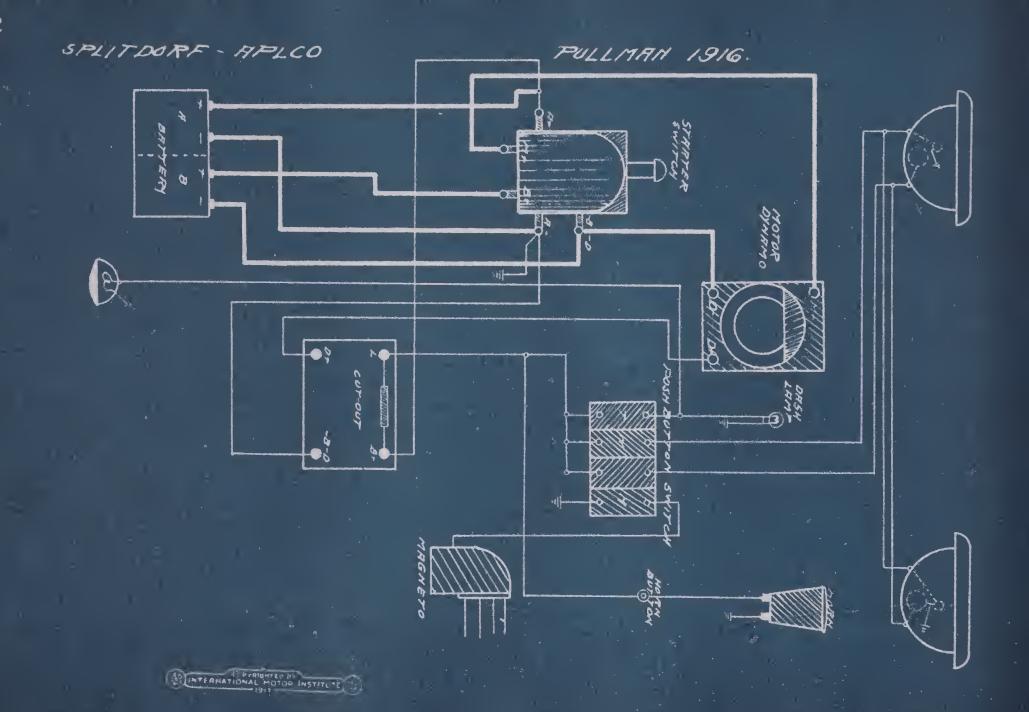


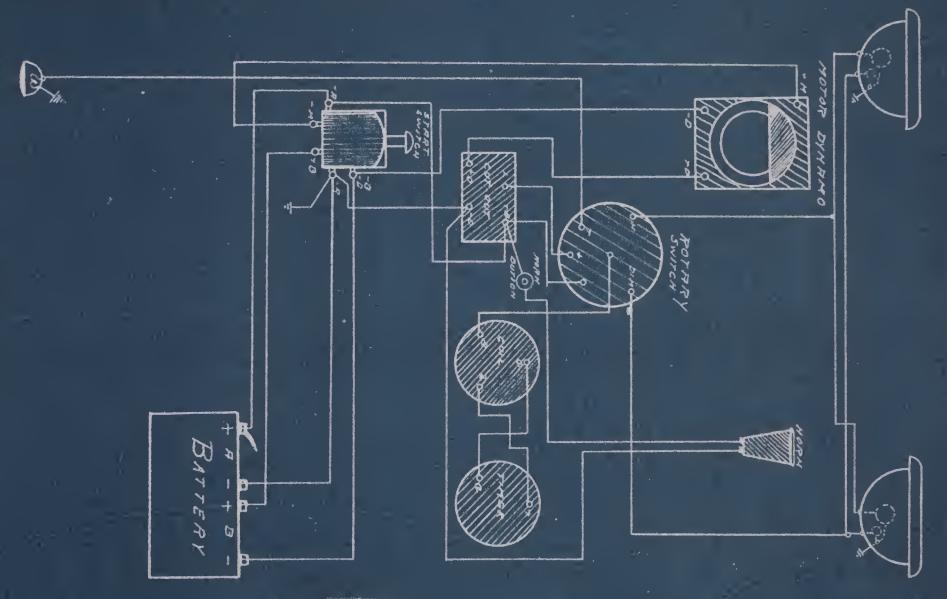
SPLITDORF INDIAN MOTORCYCLE





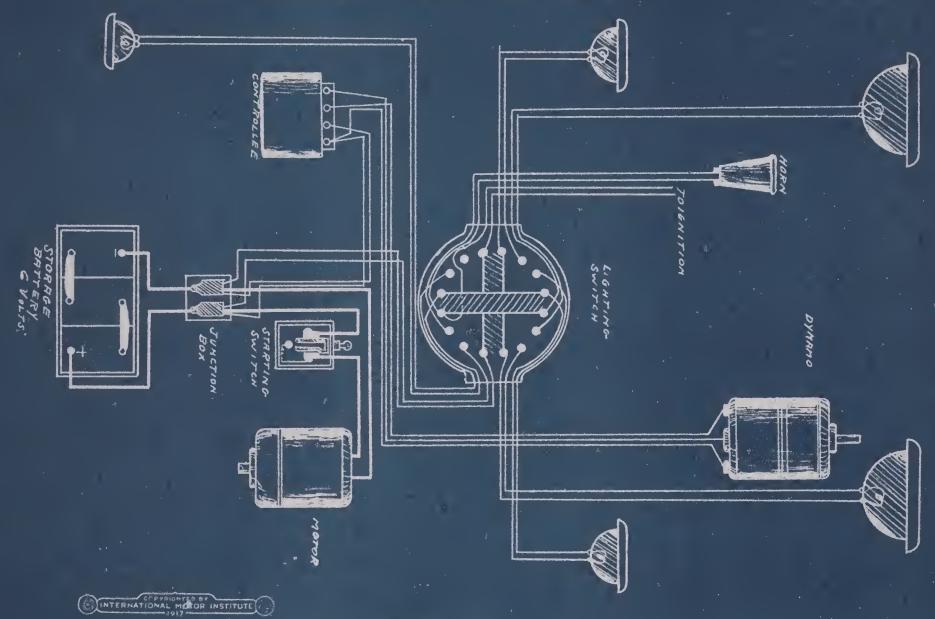


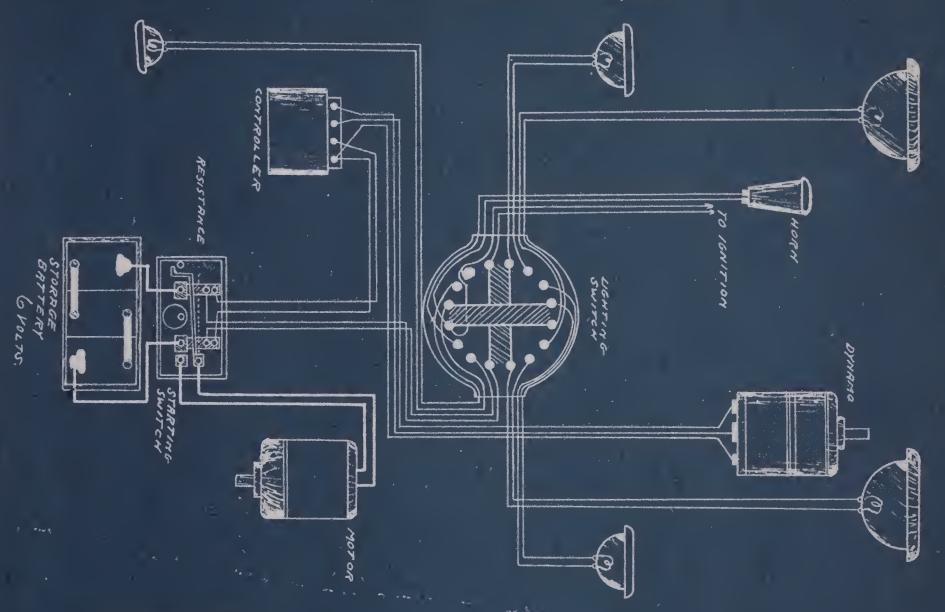


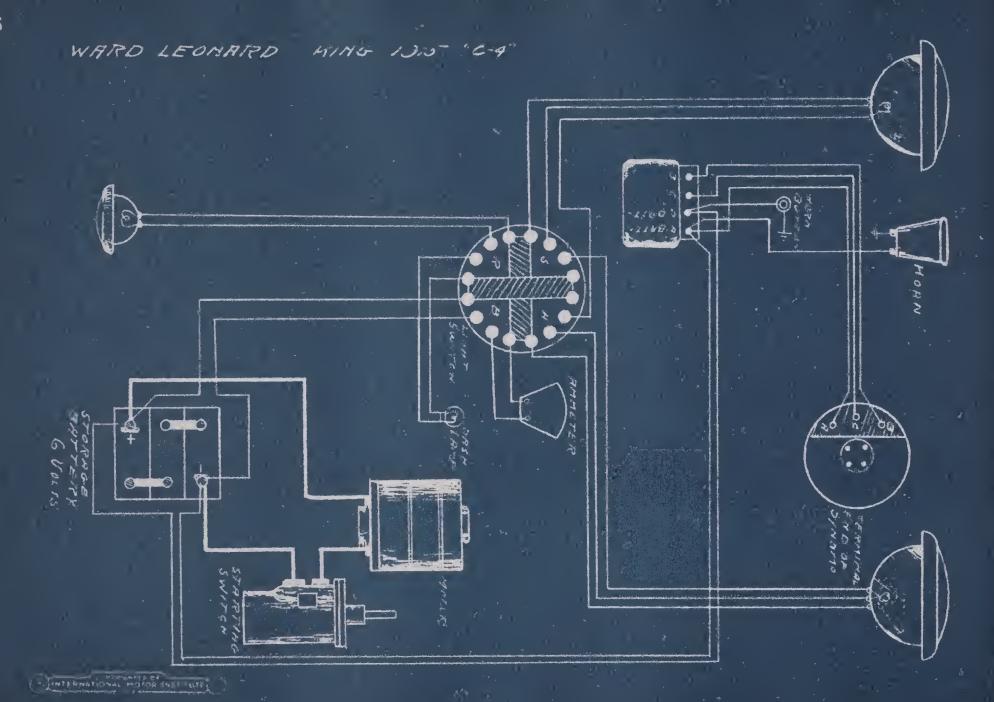


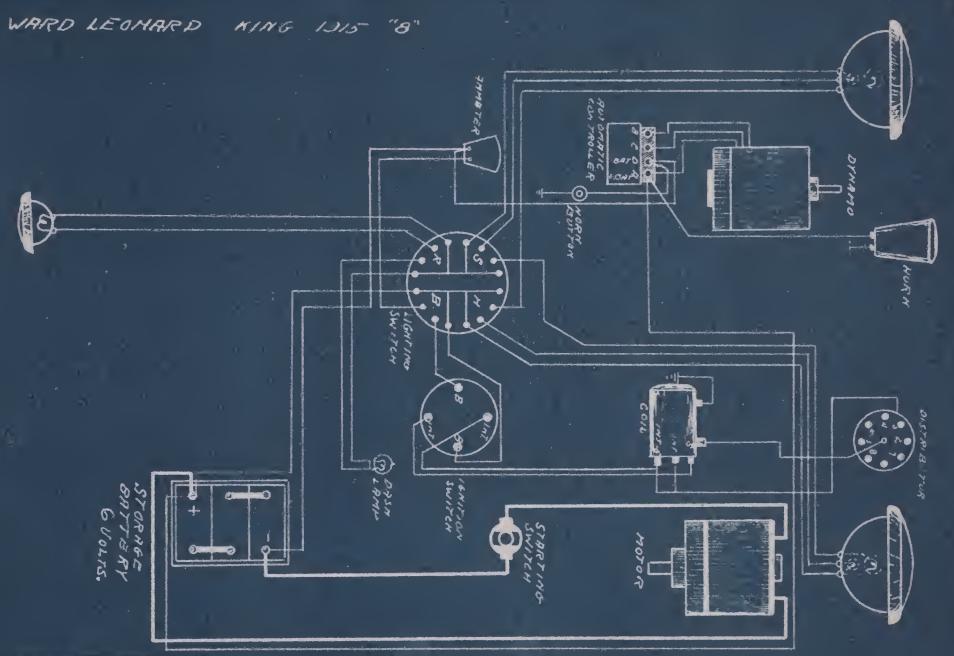
CONSTRUCTIONAL PROTOS INSTITUTES

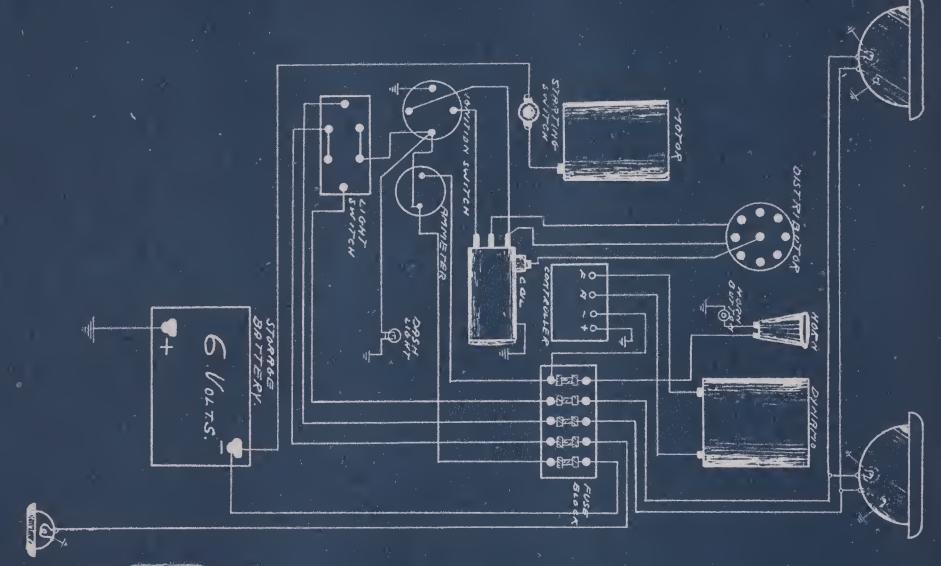
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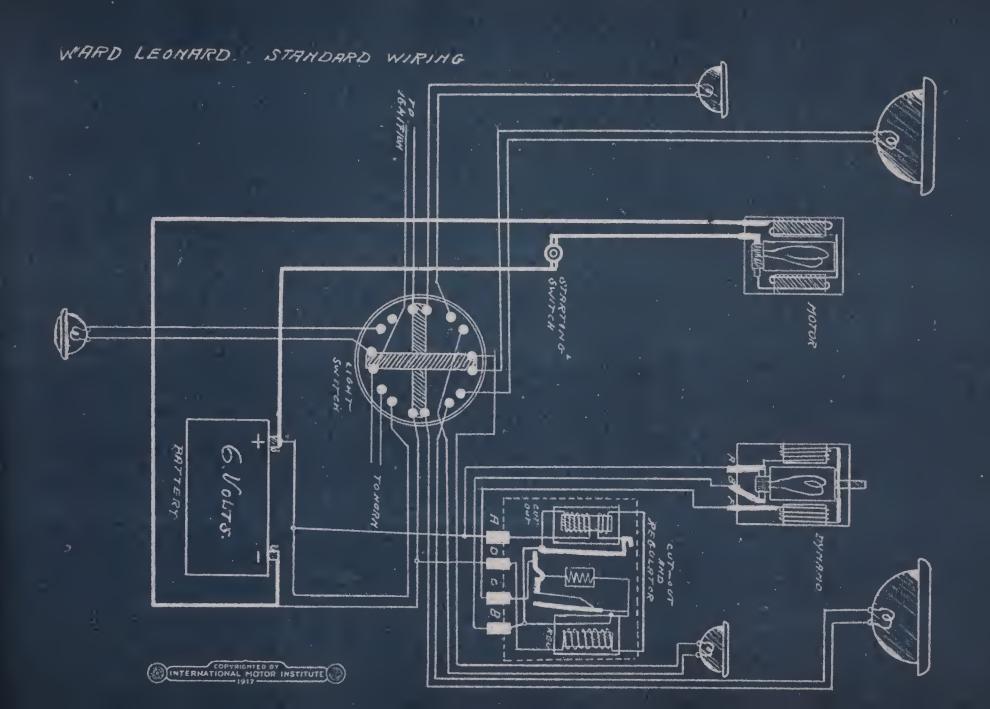


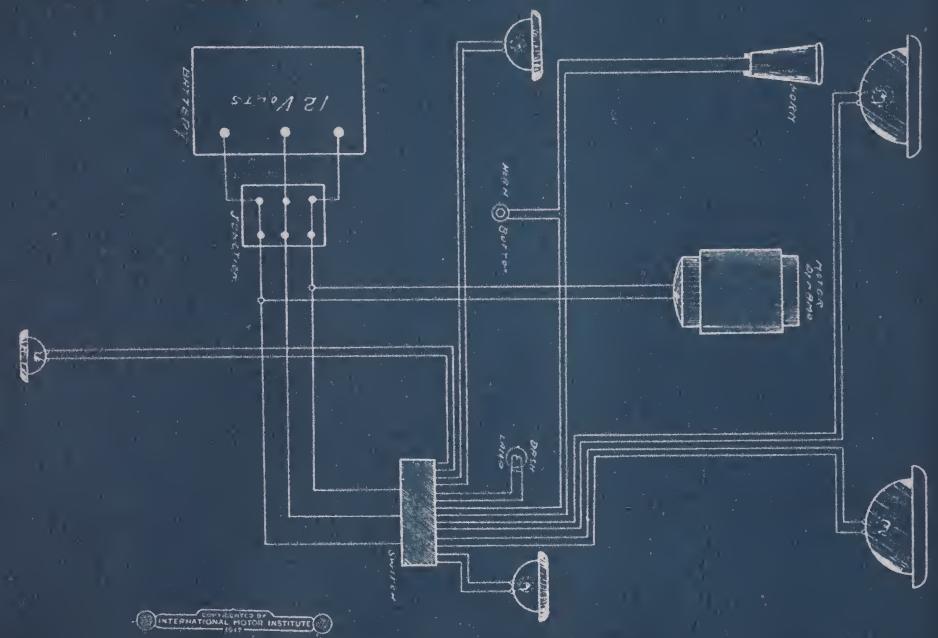


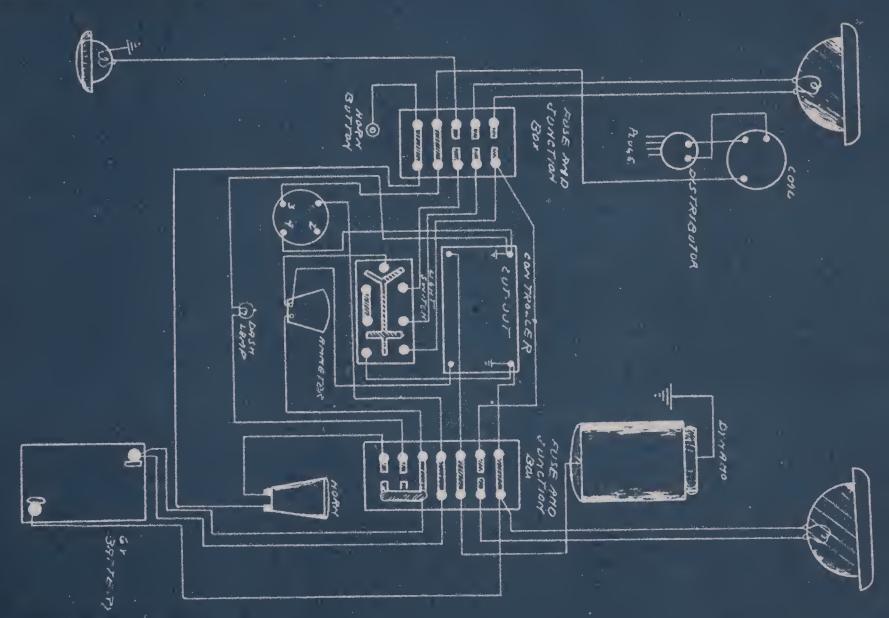


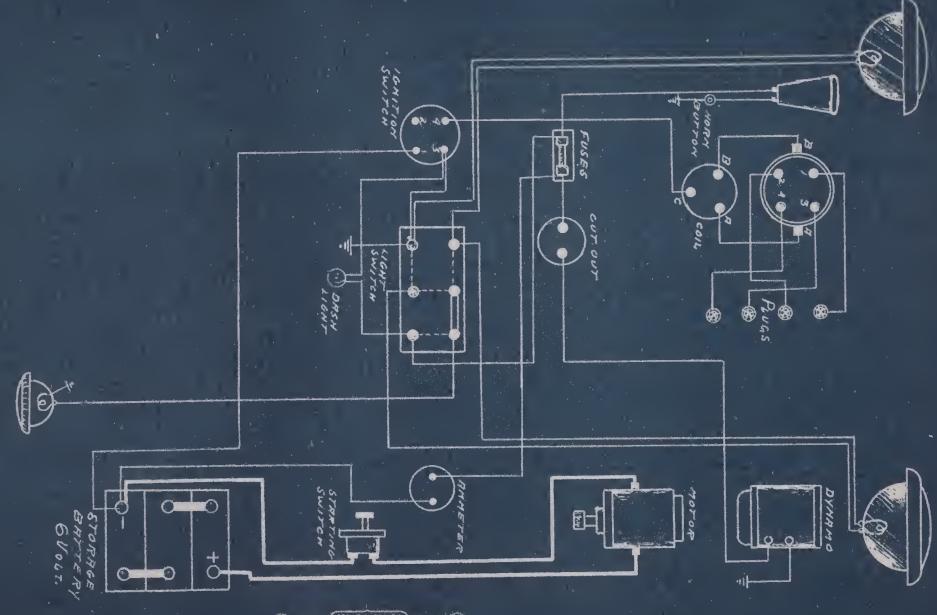


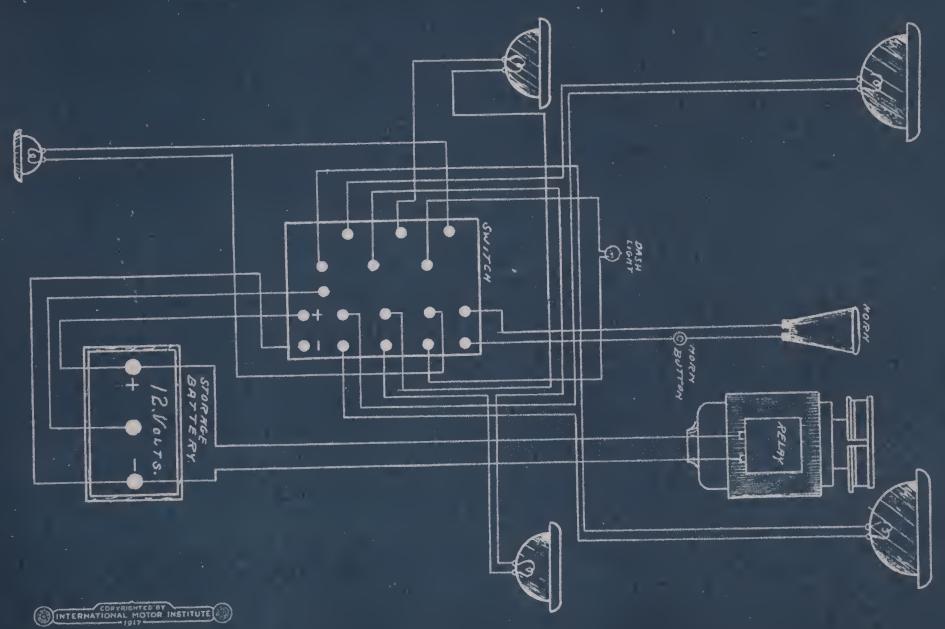


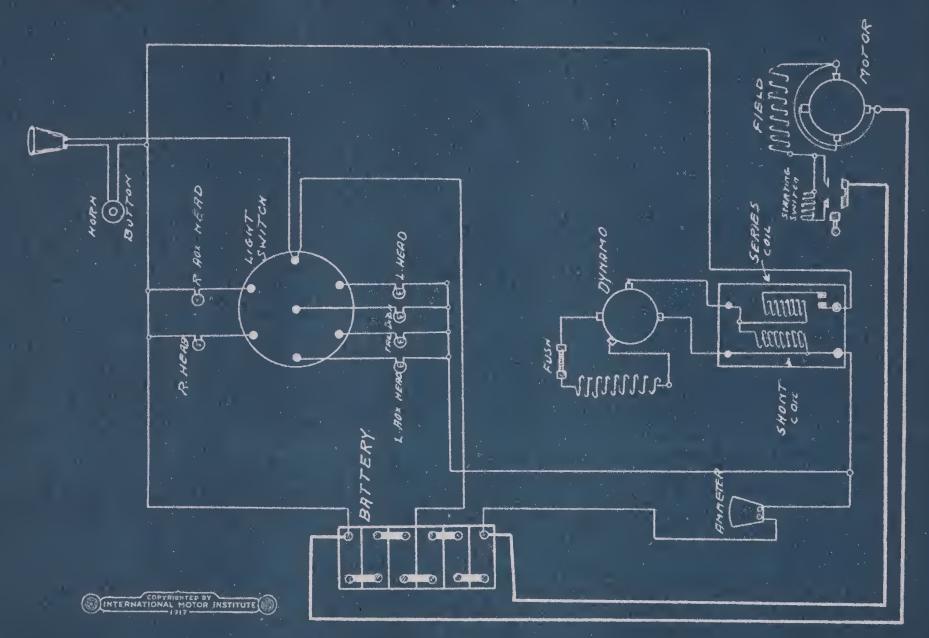


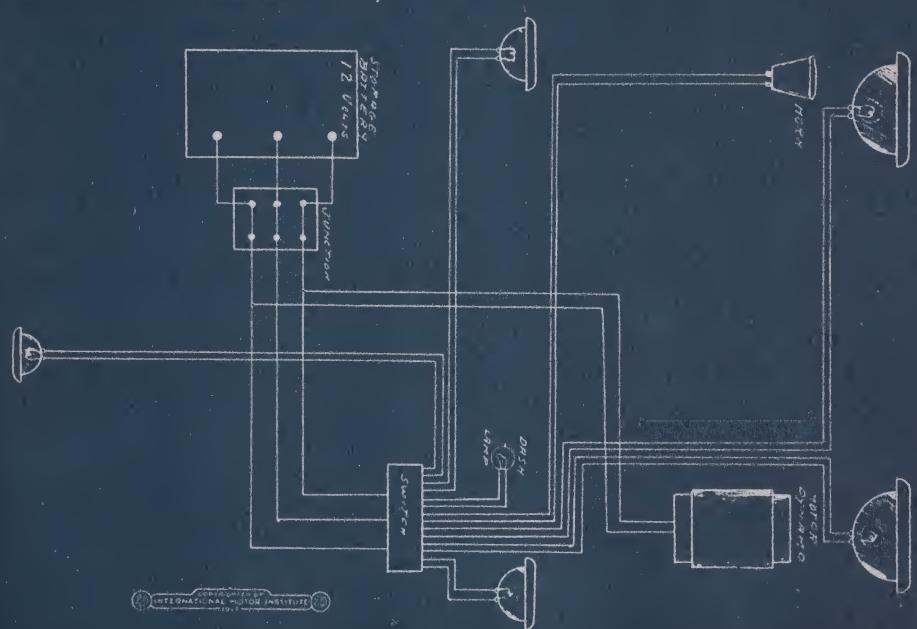


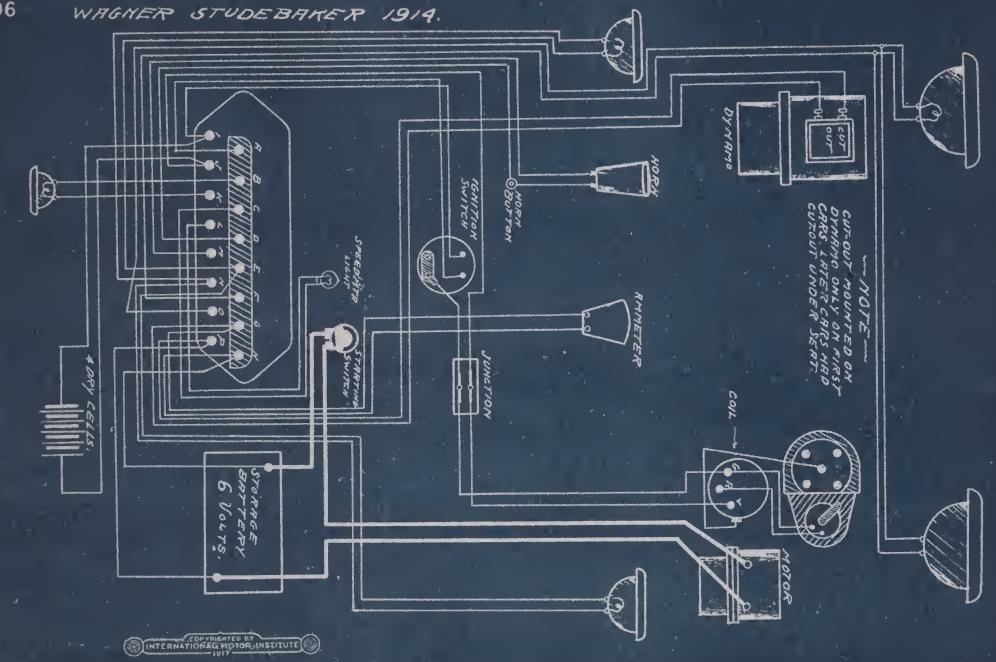




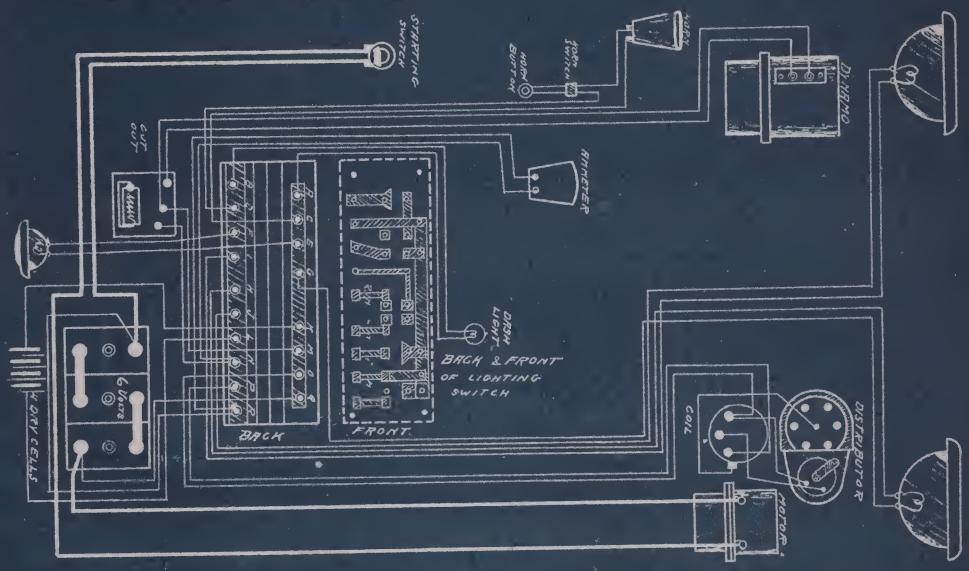




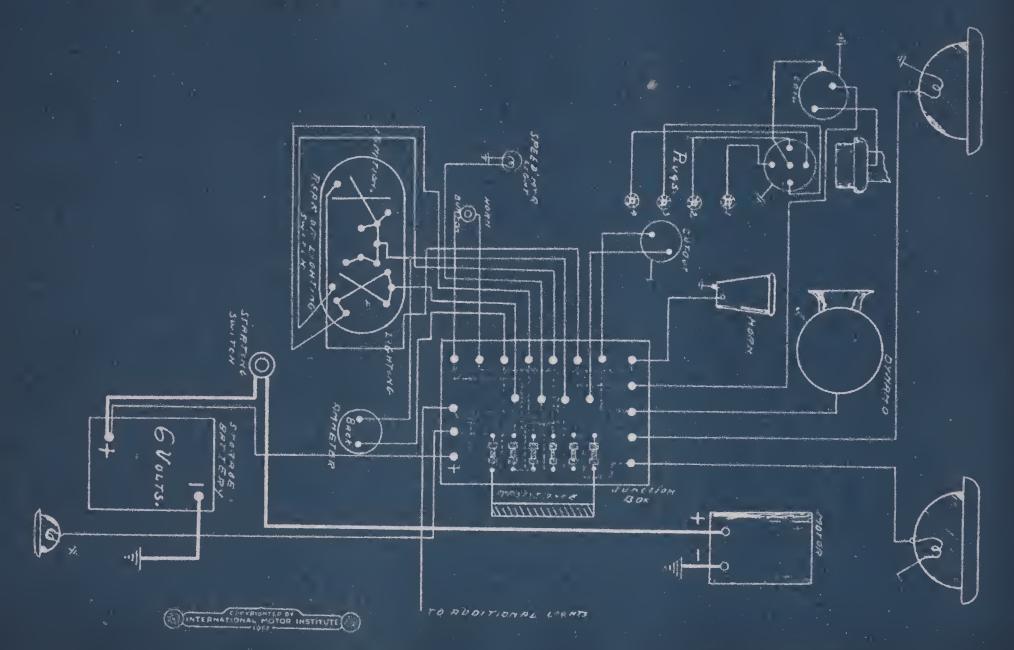


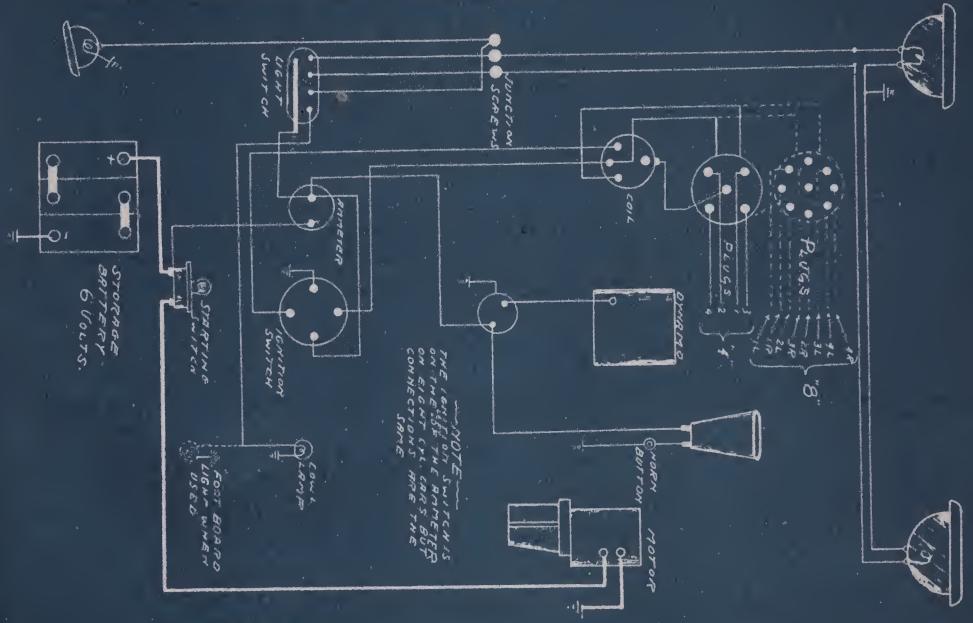


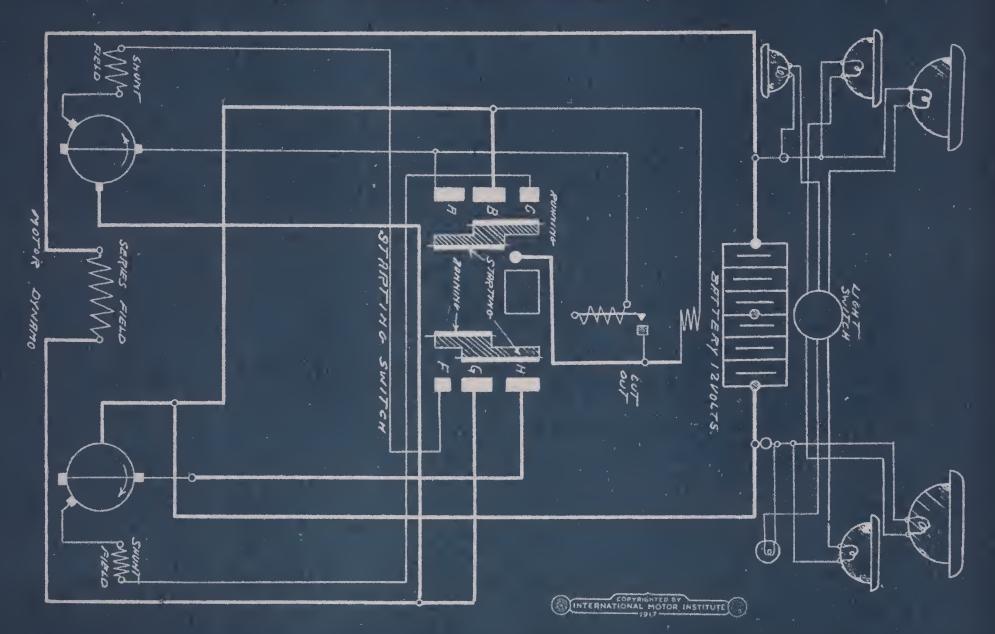
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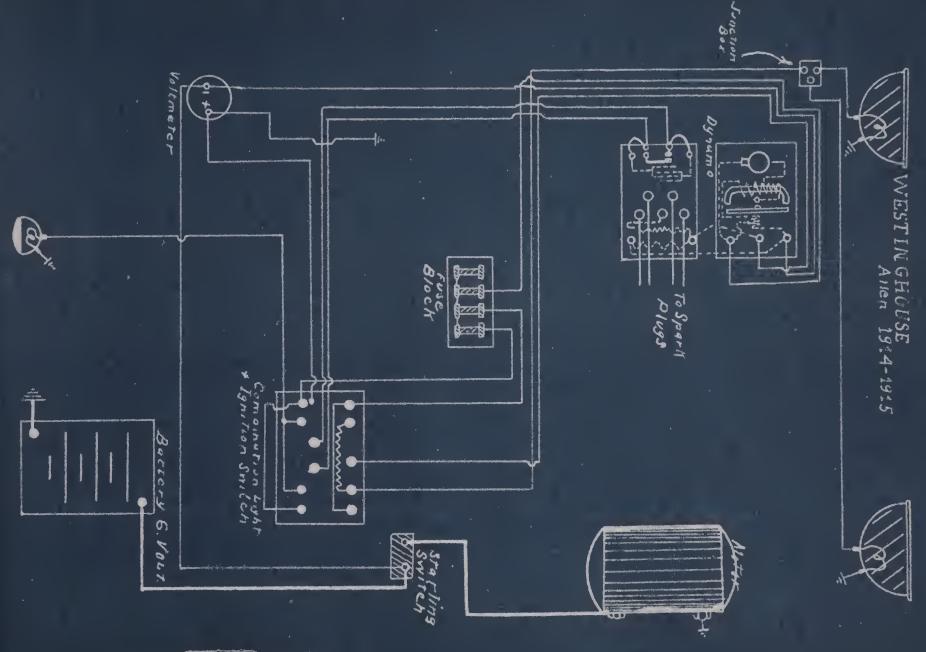




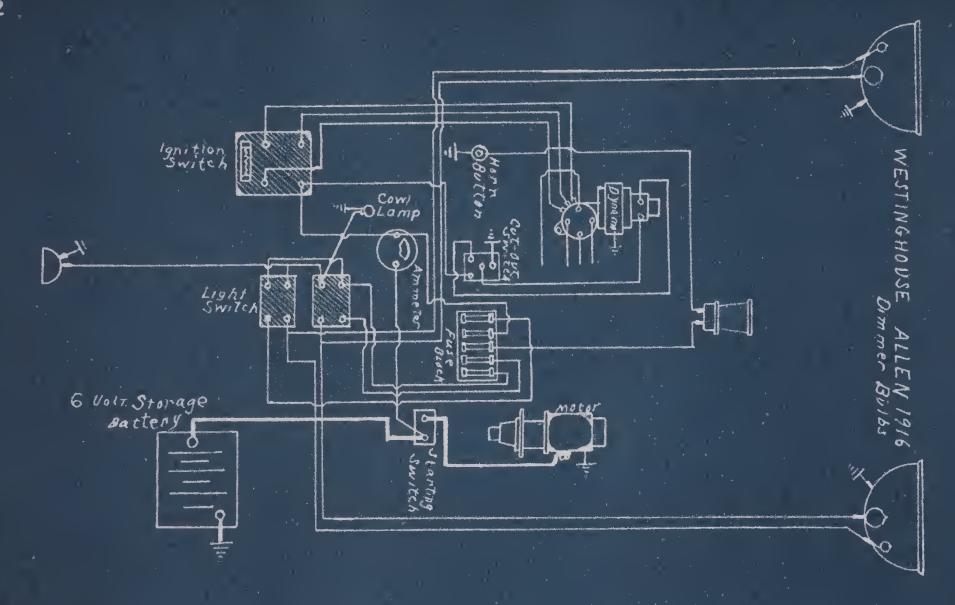


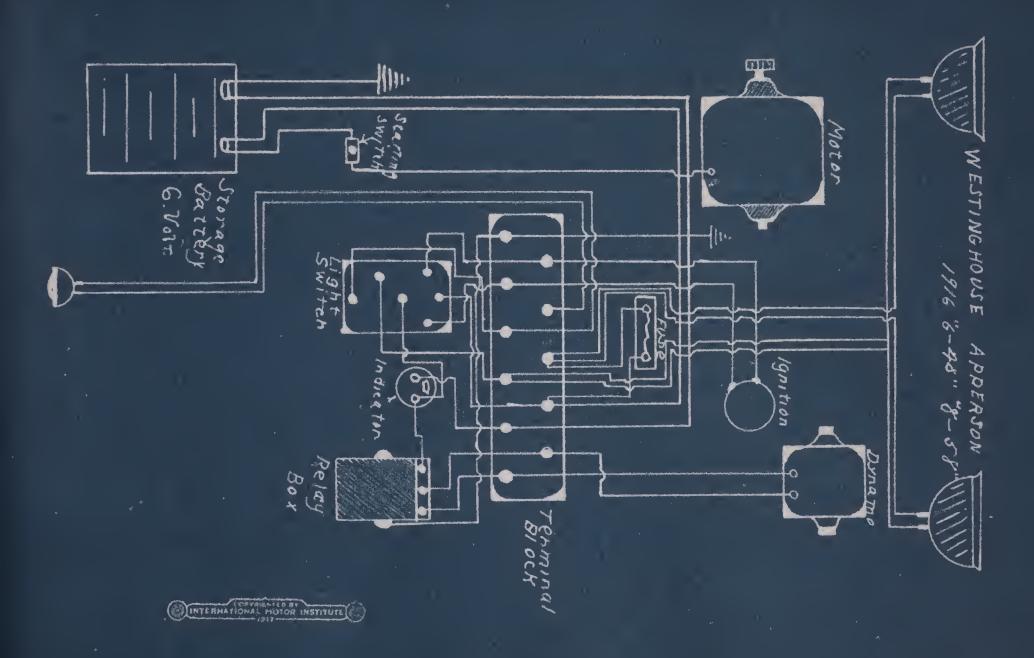


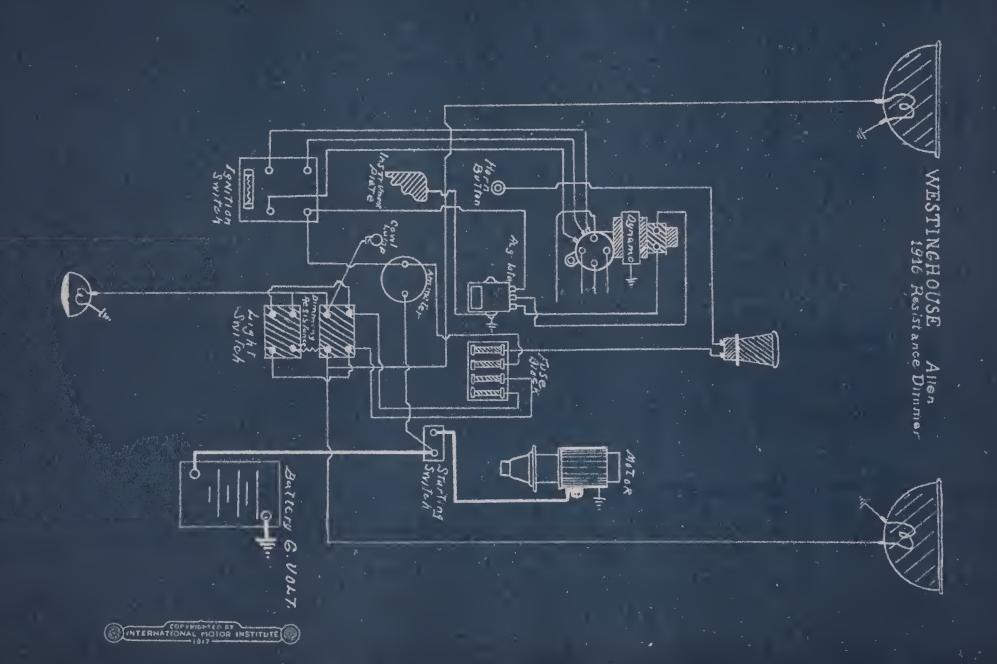


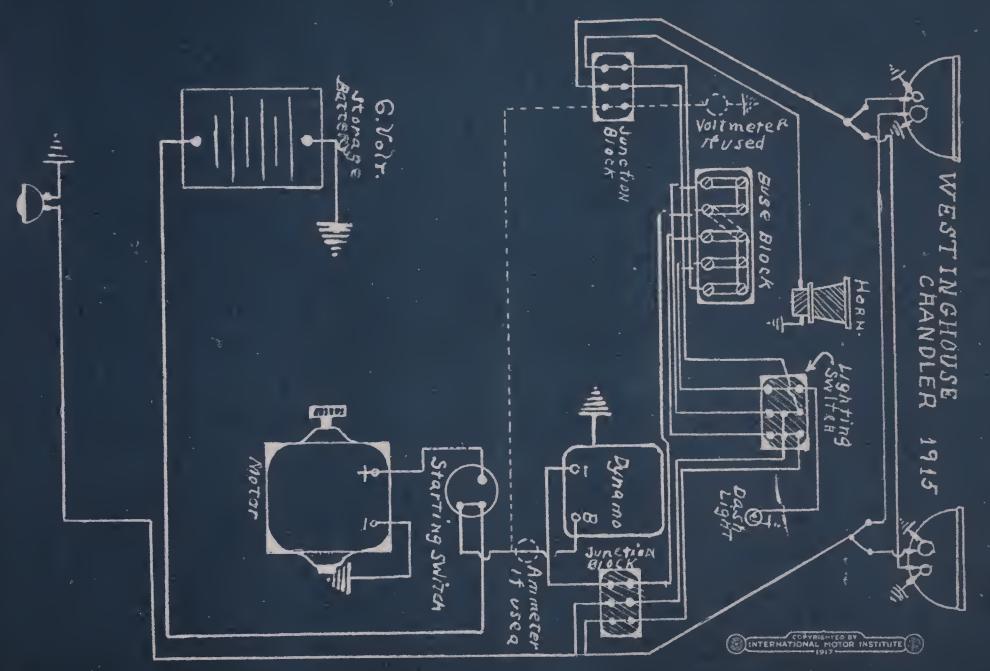


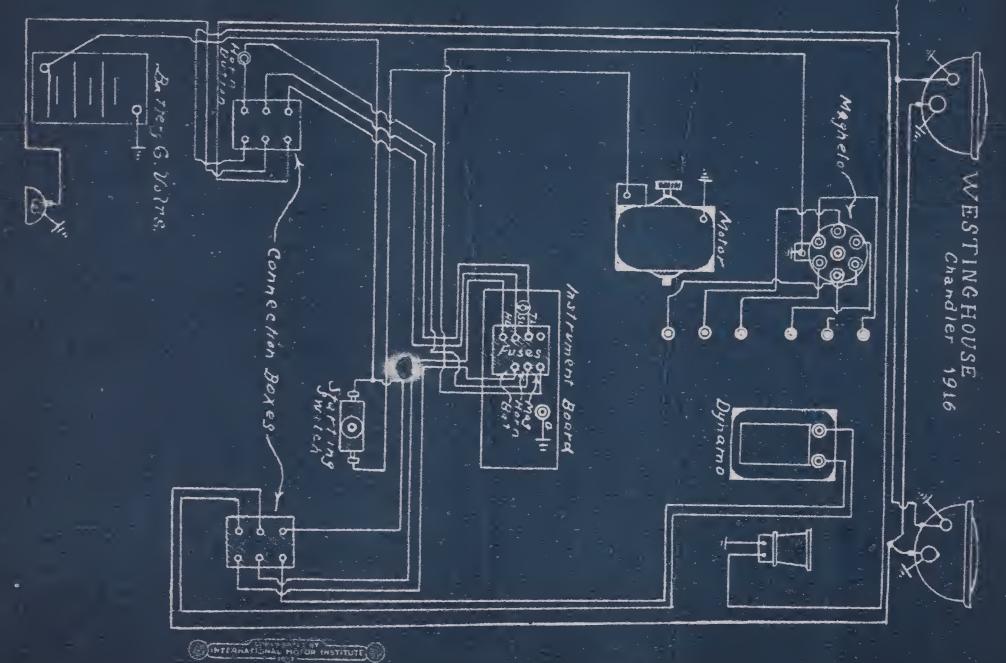


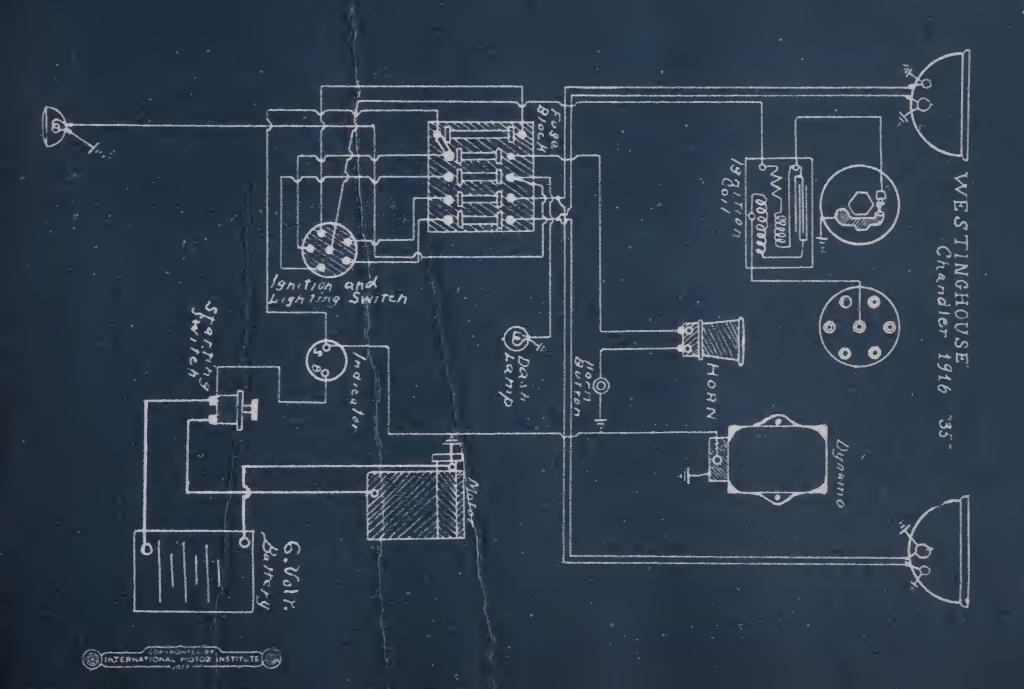


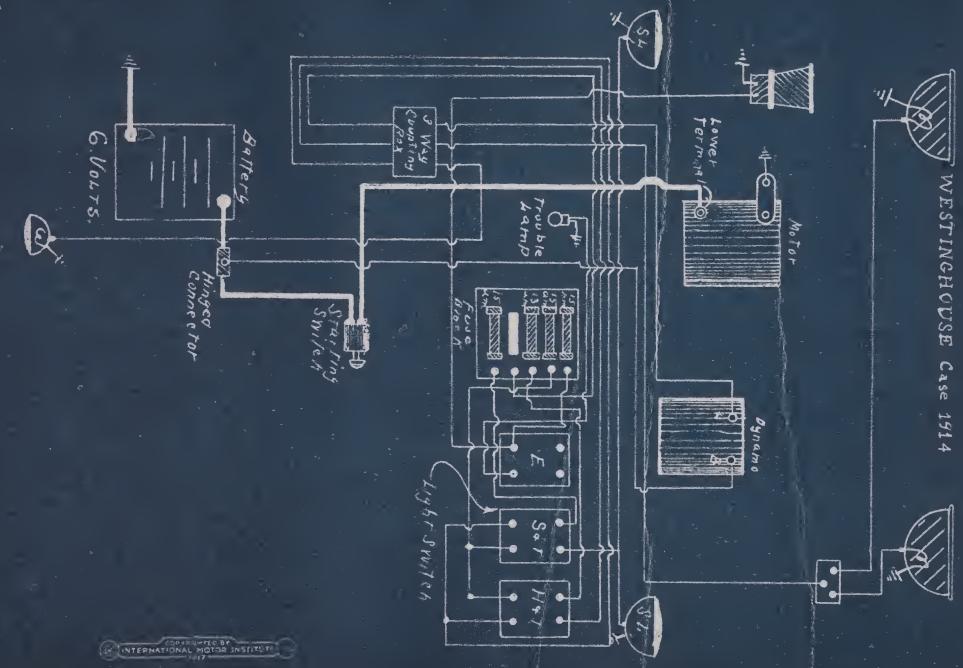


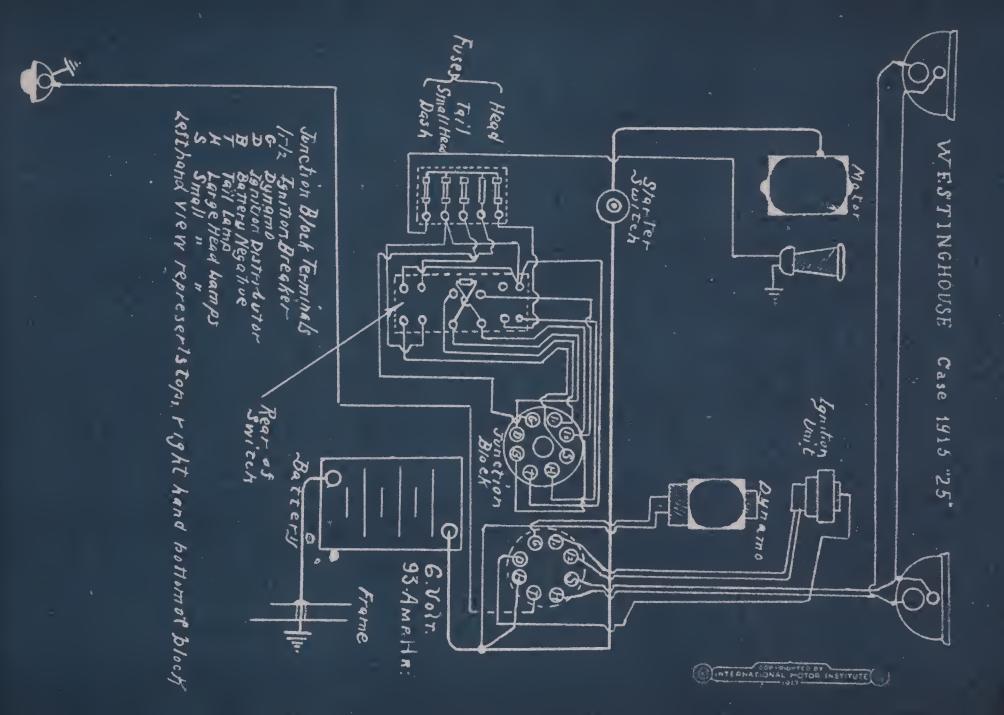


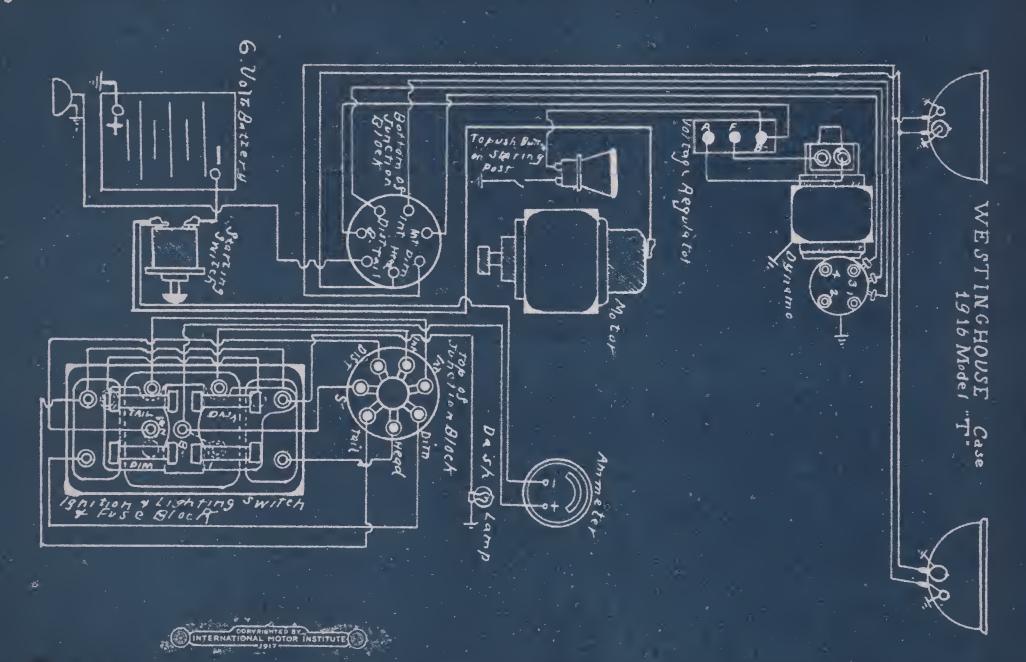


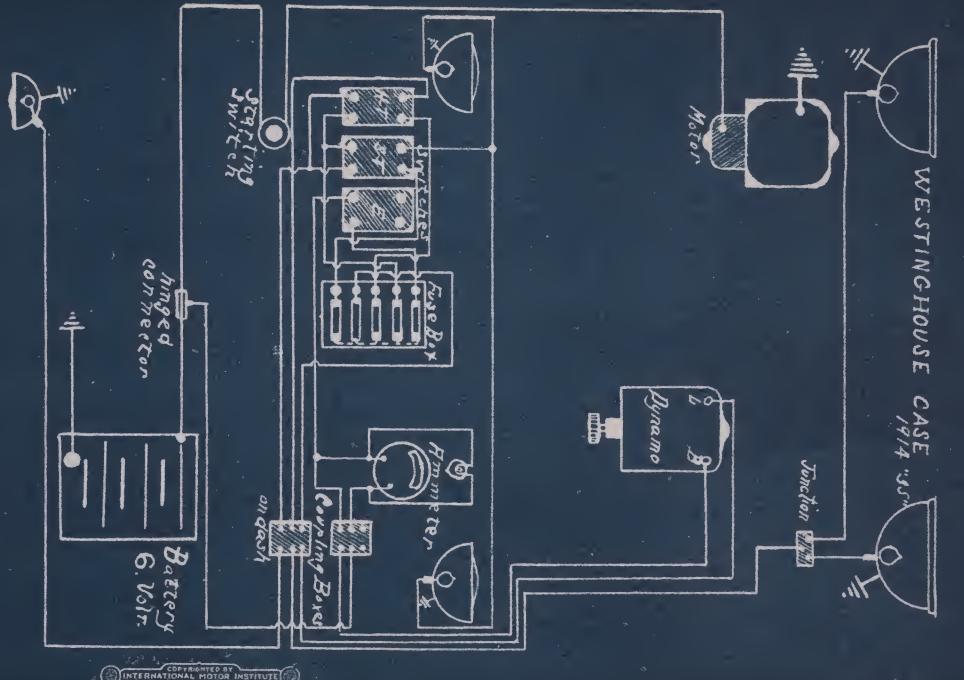


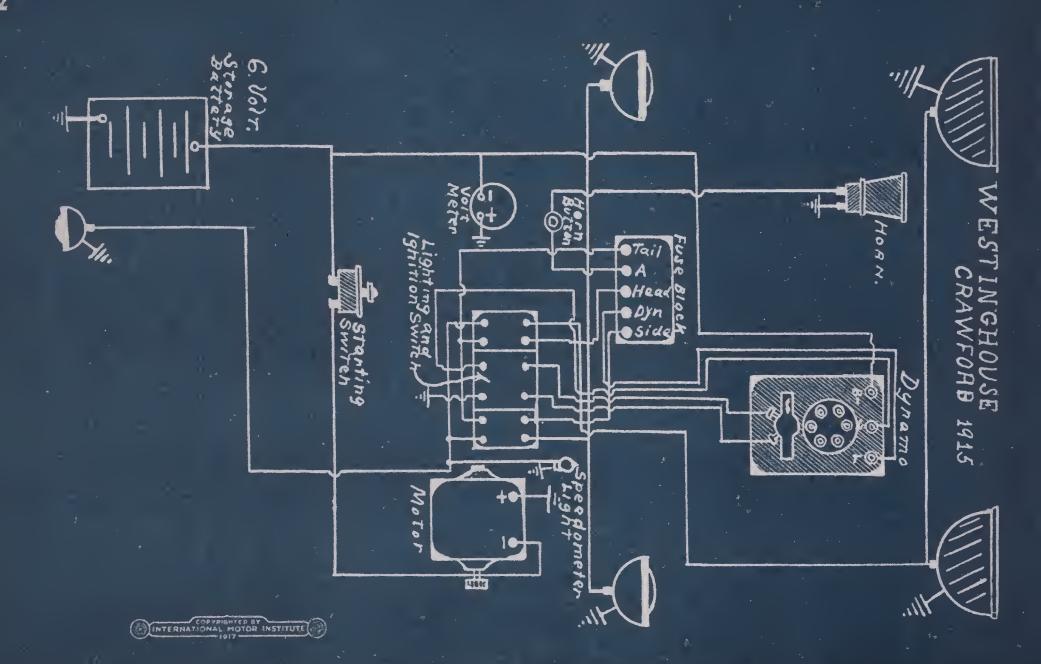


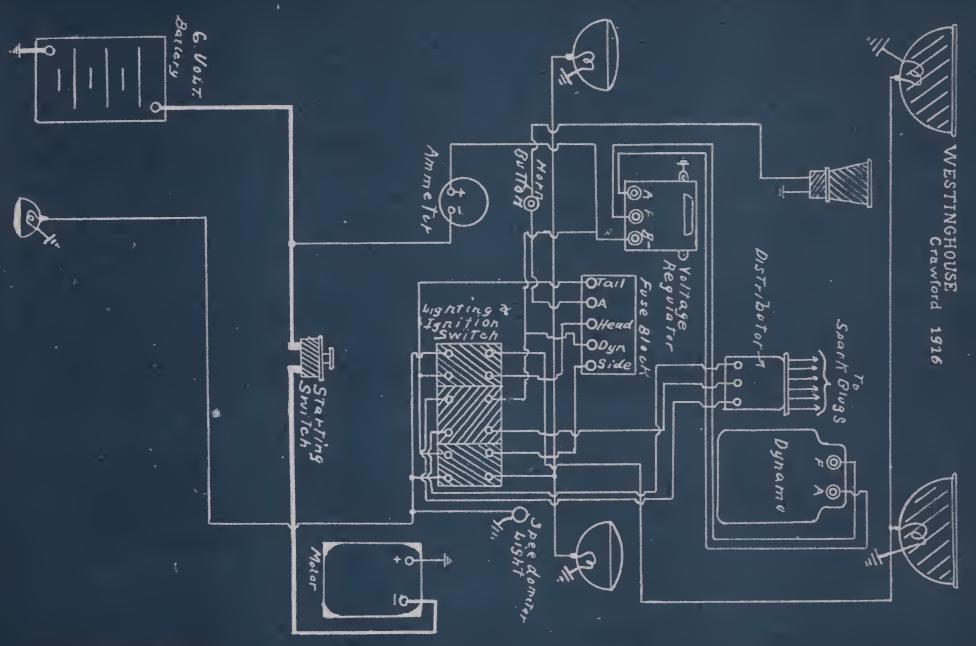


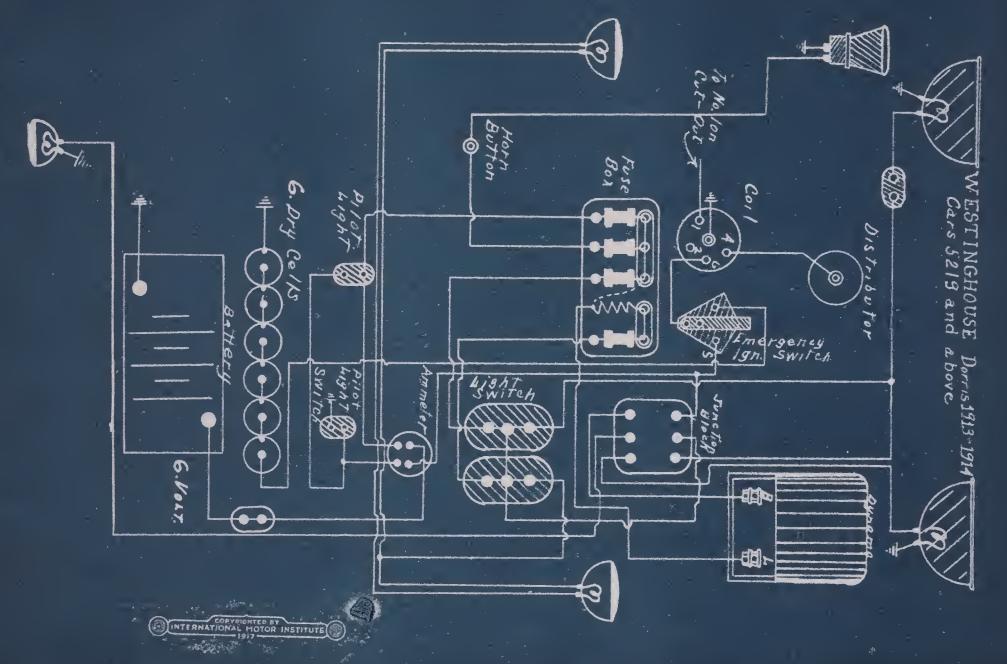


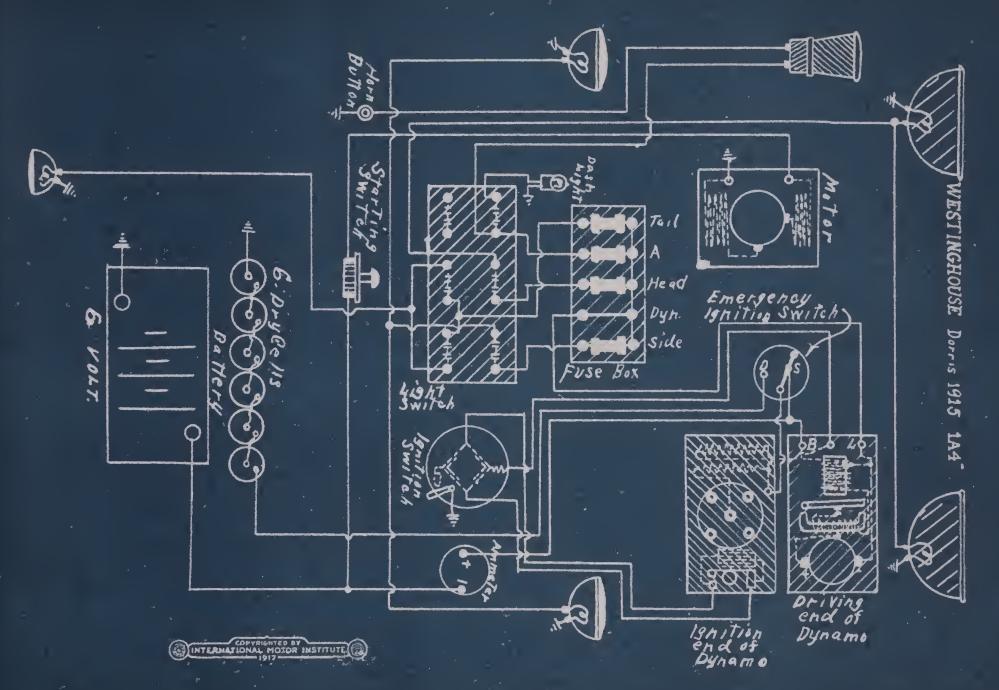


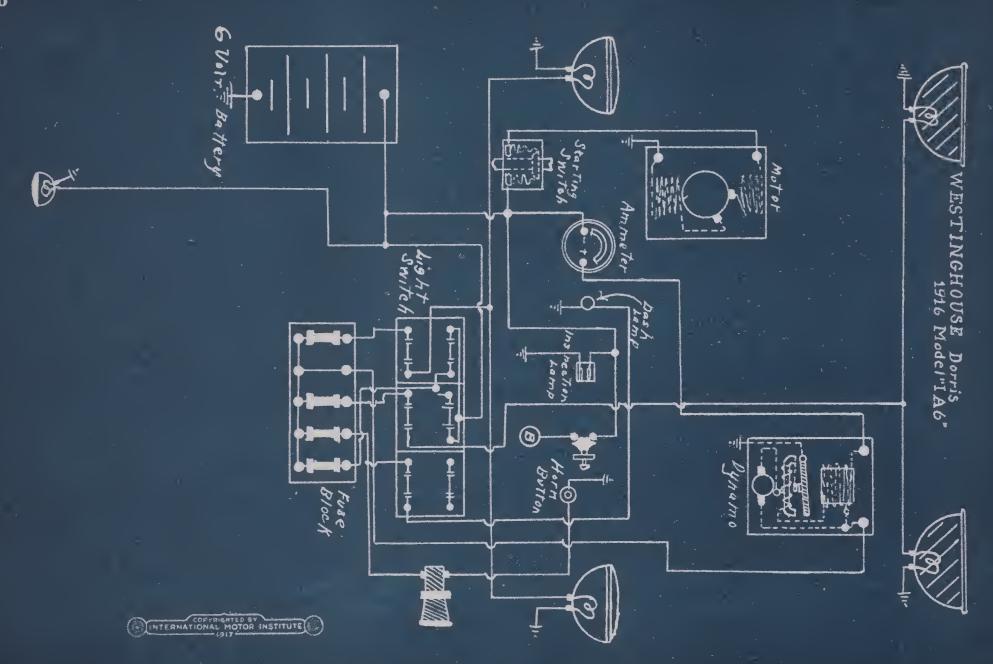


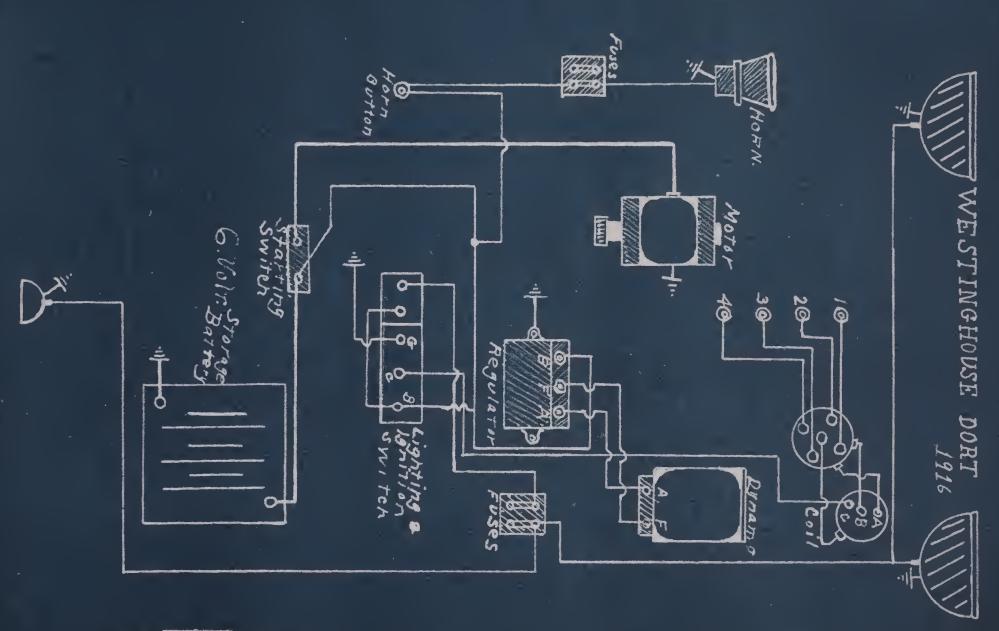


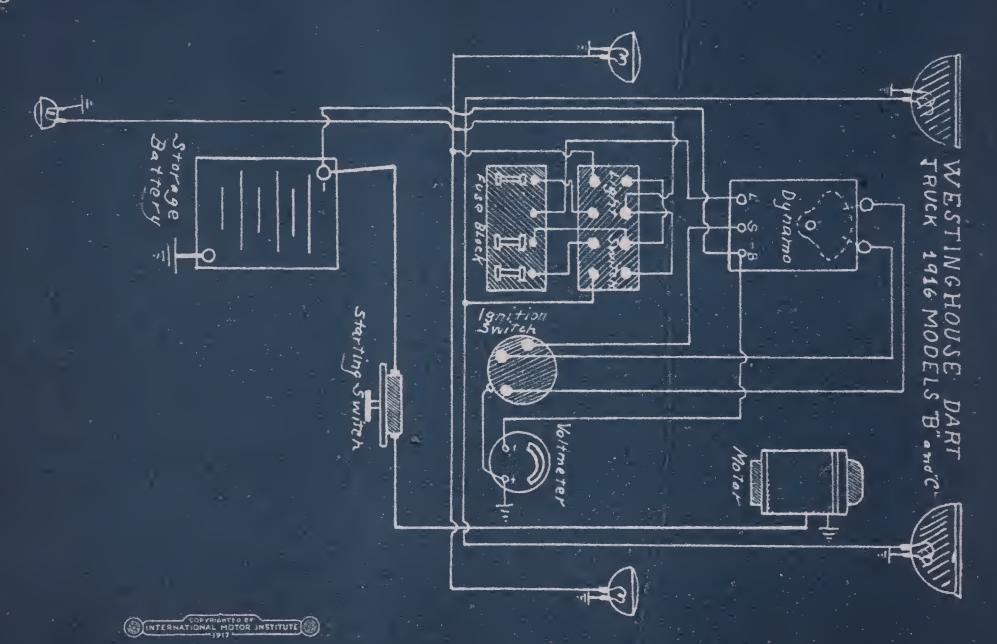


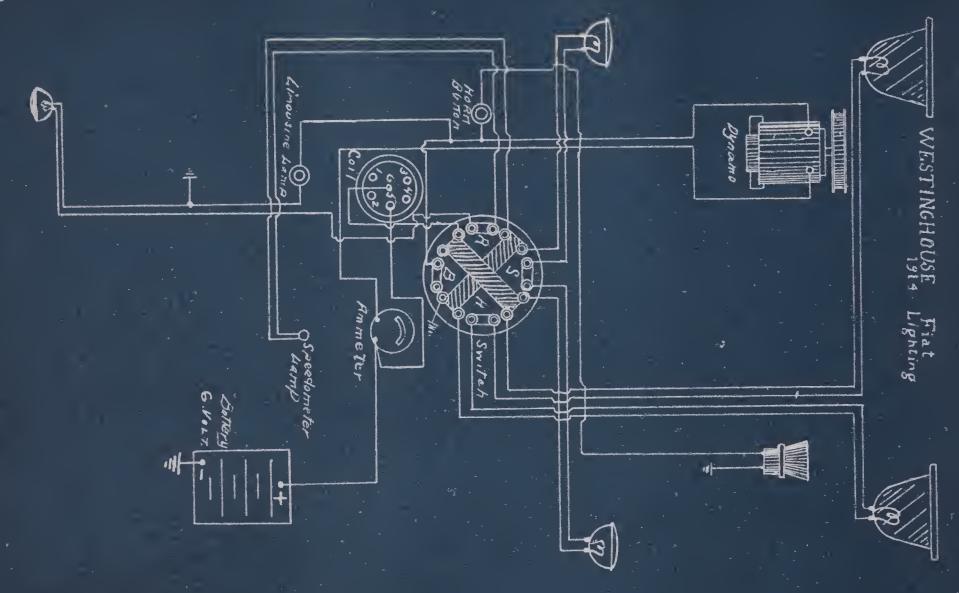


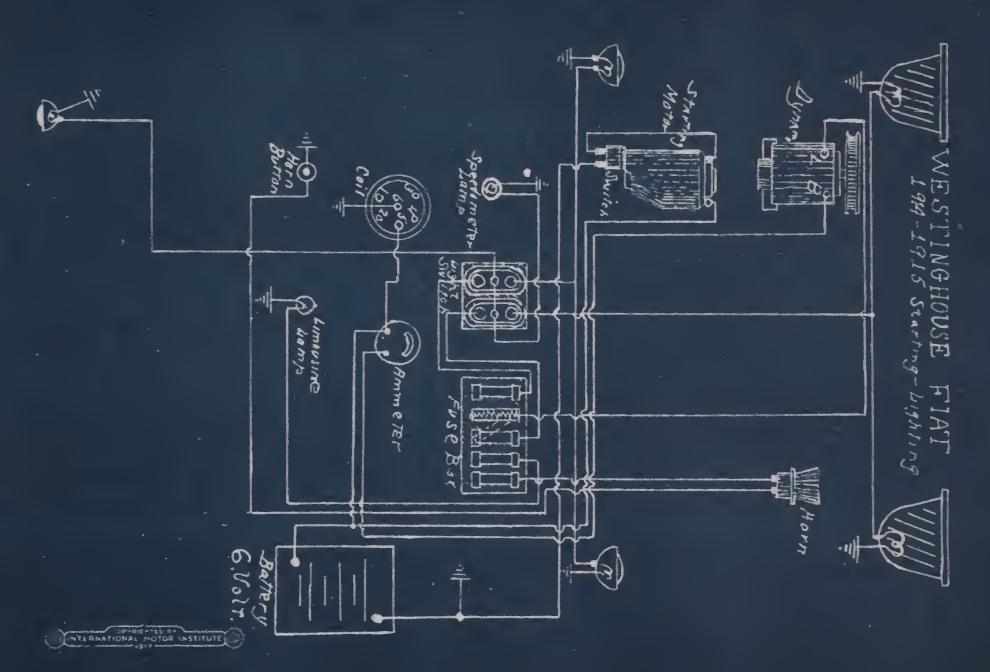


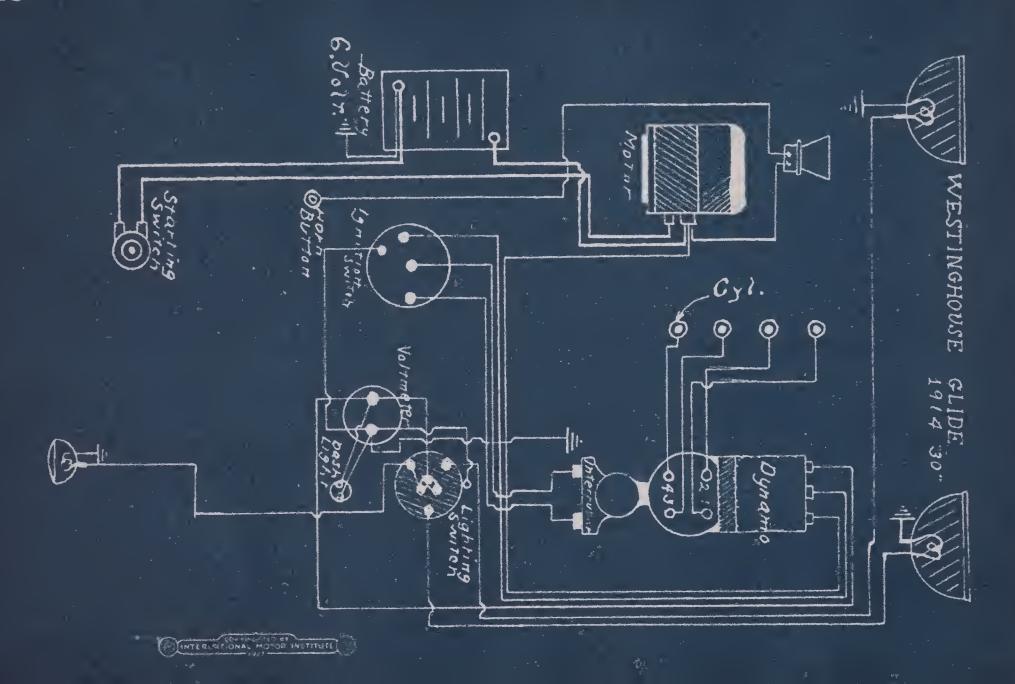


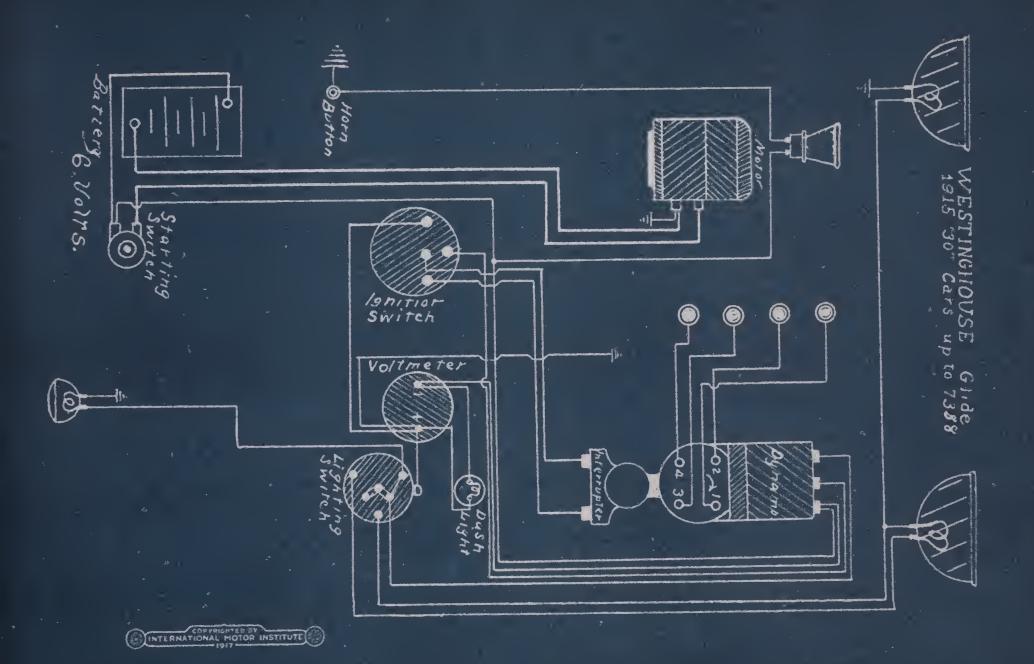


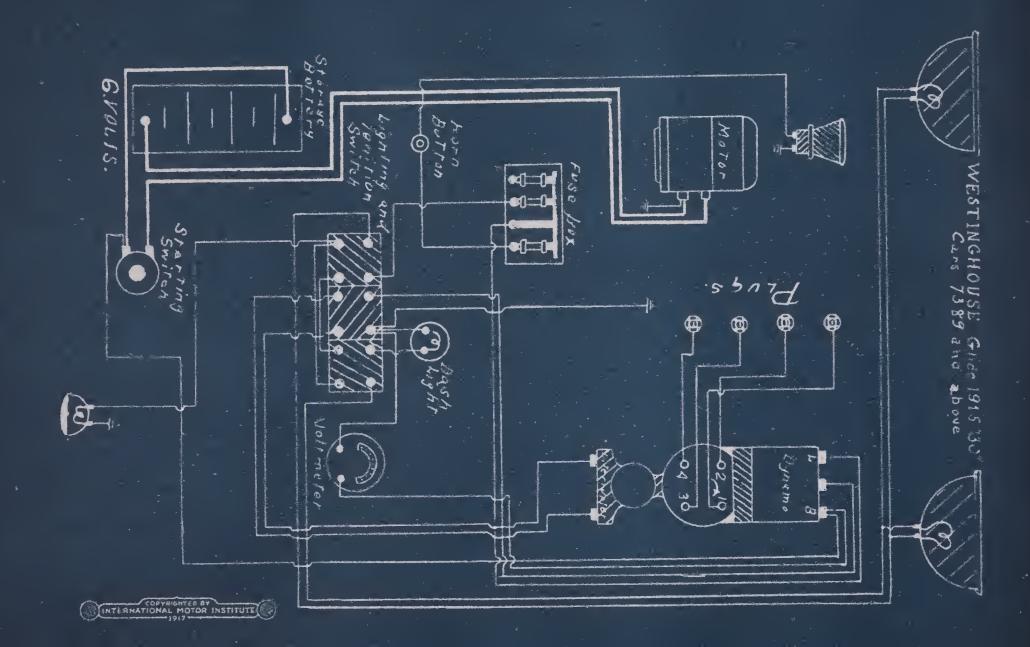


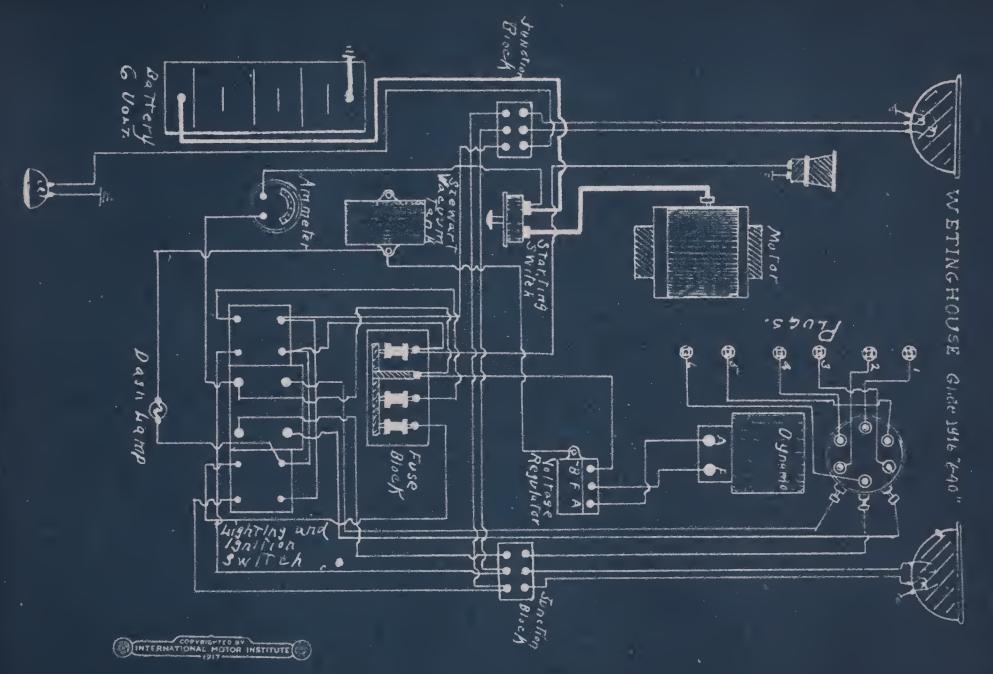


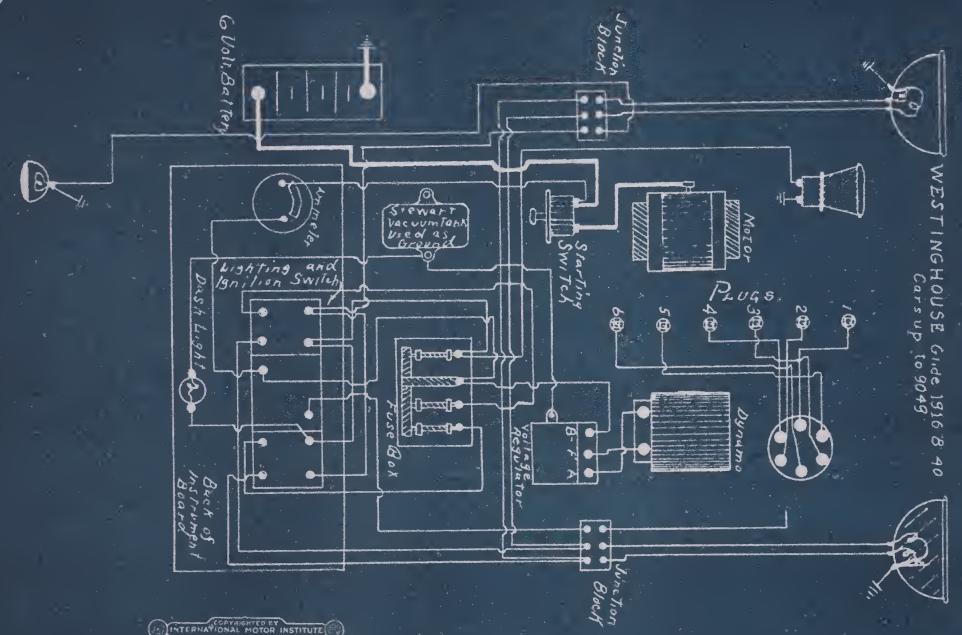


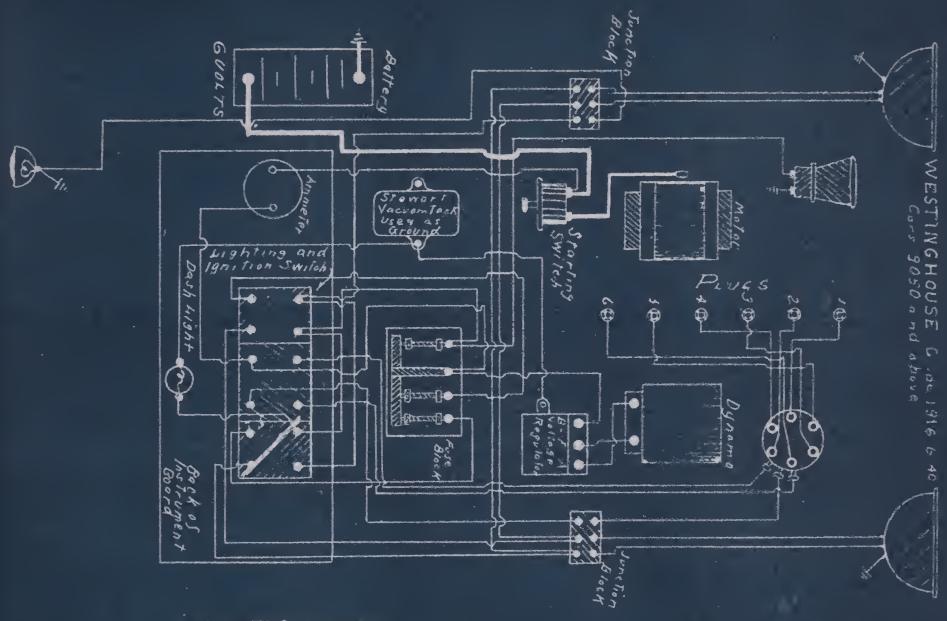


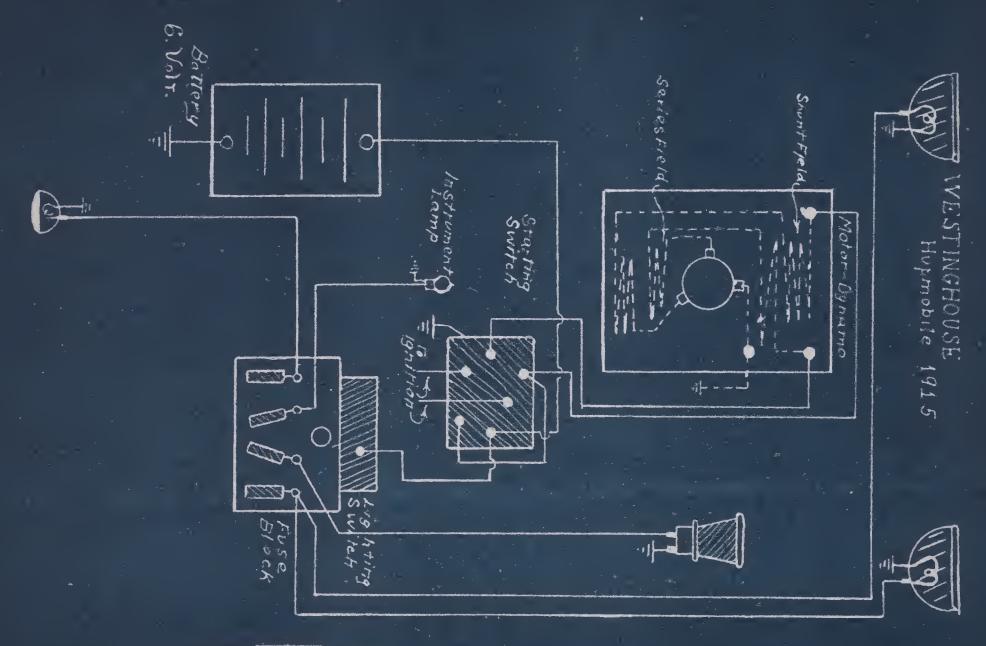


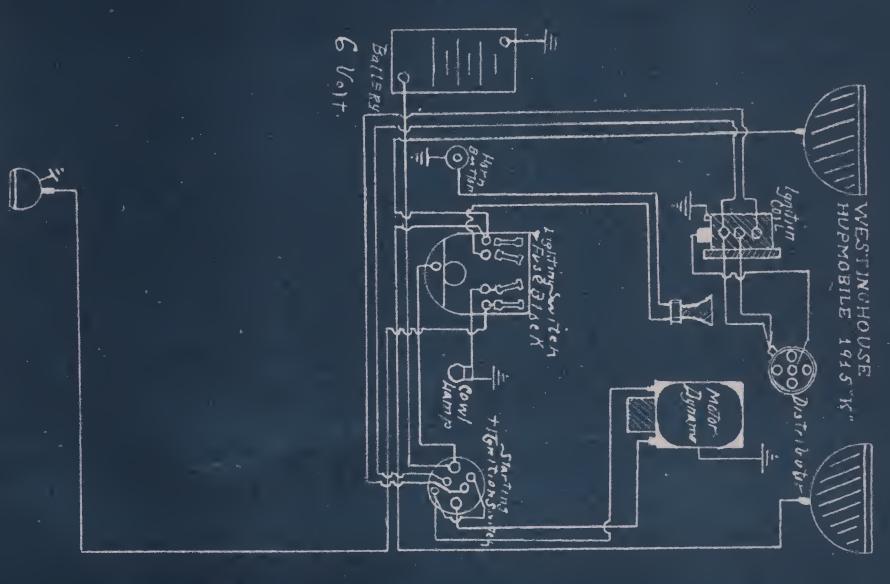


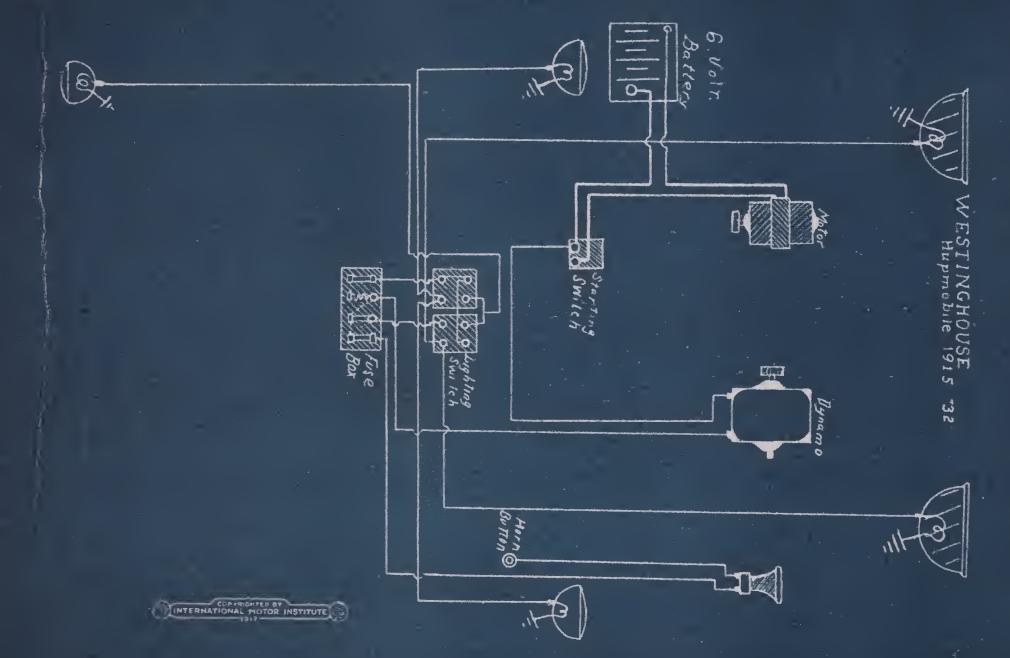


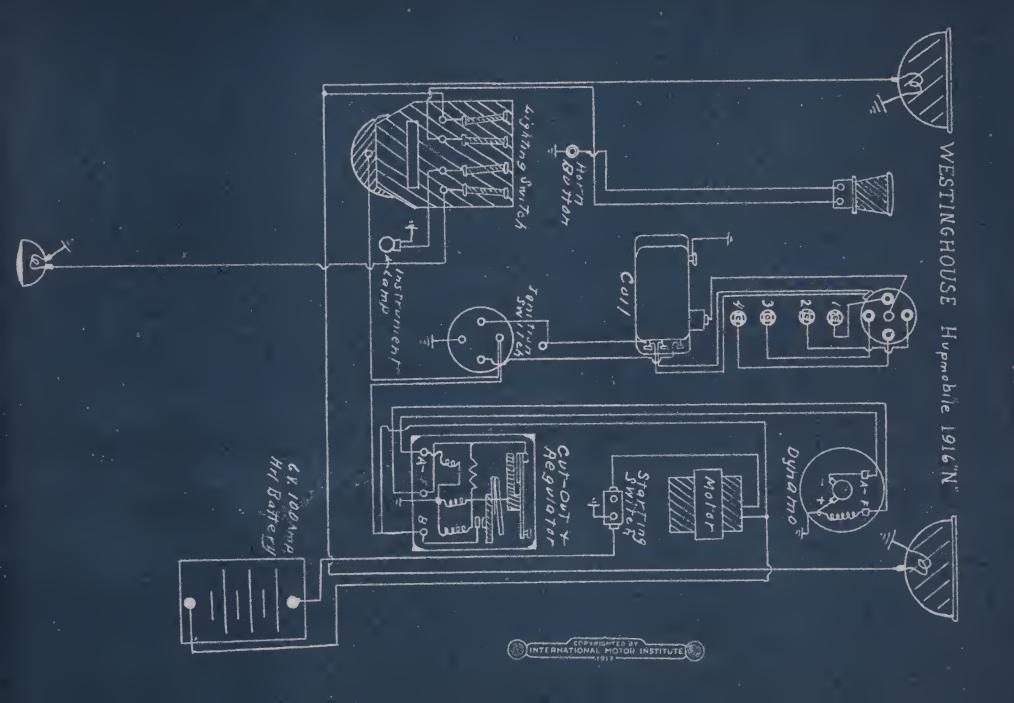


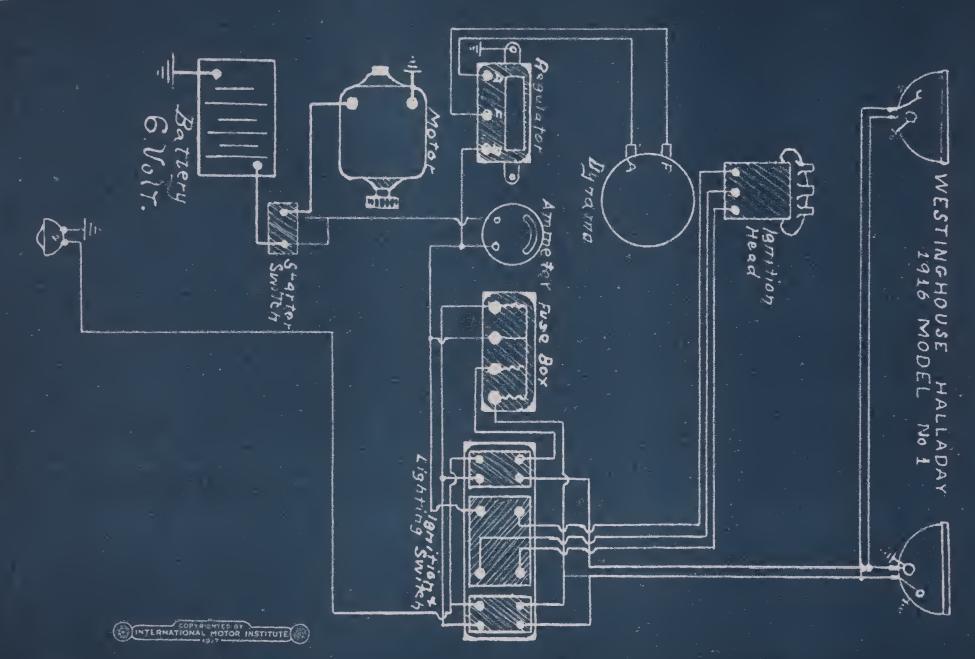


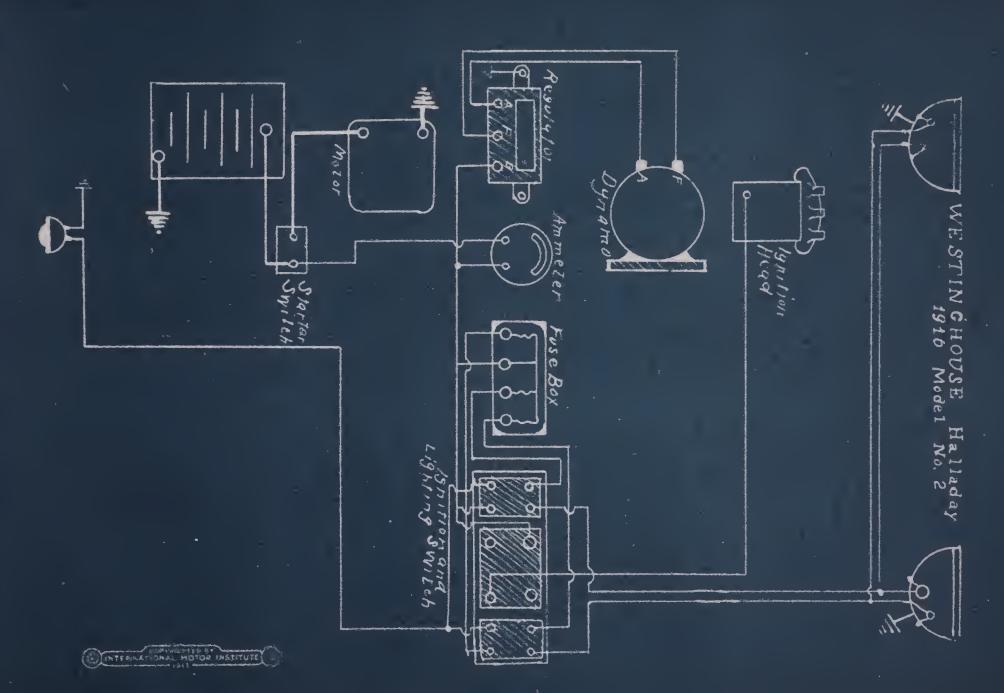


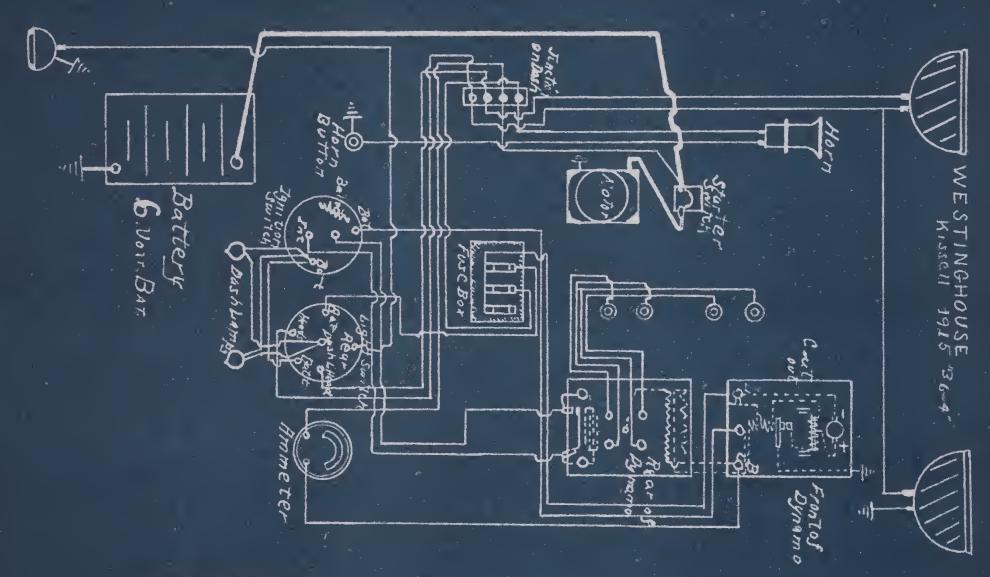


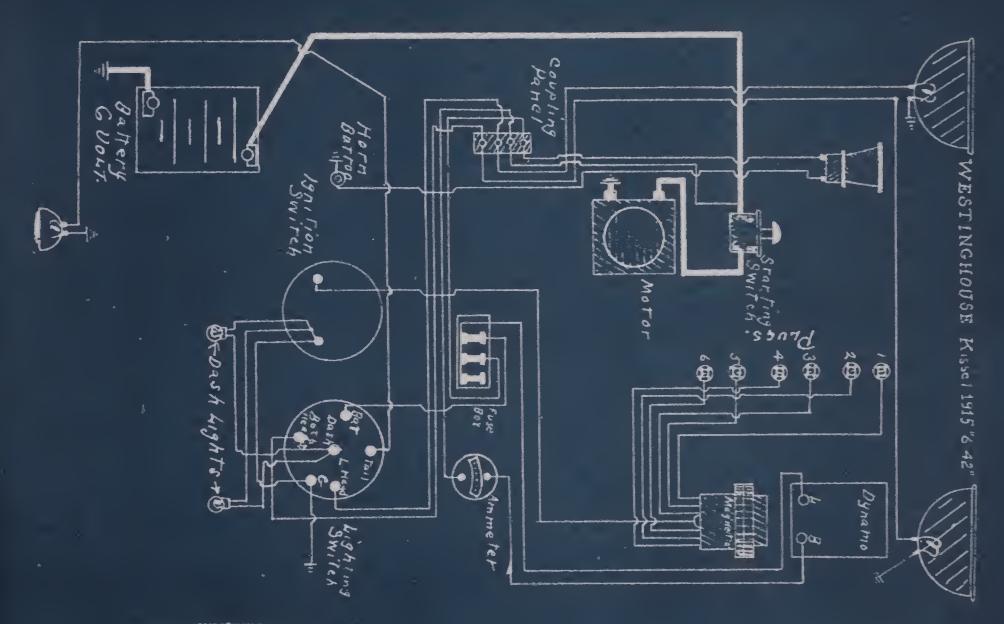


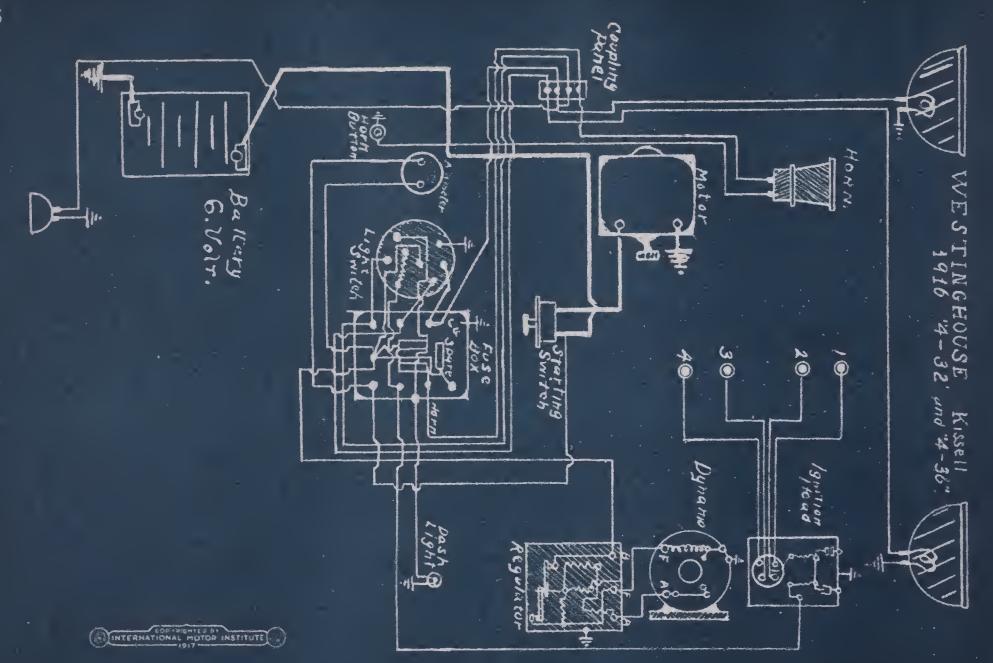


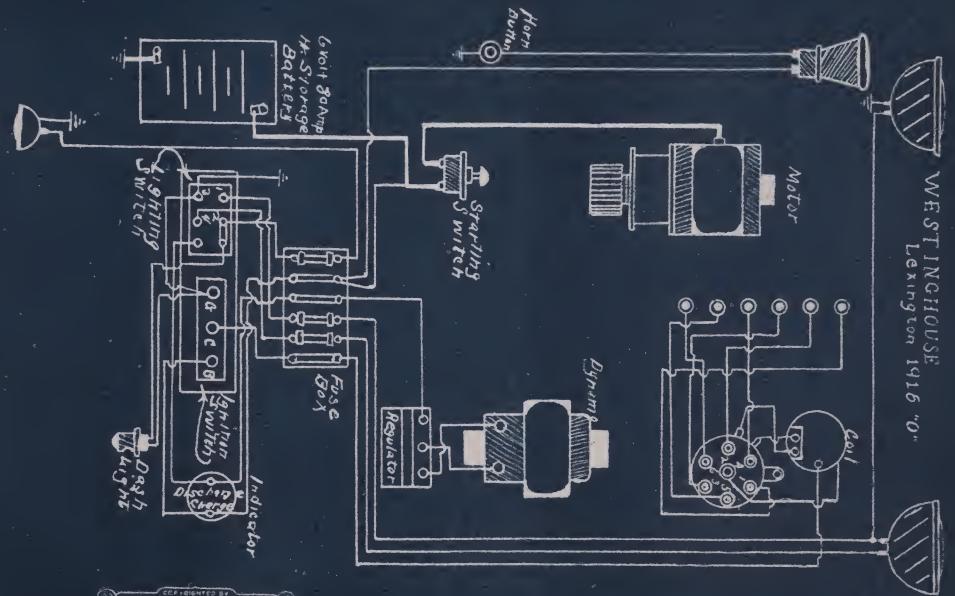


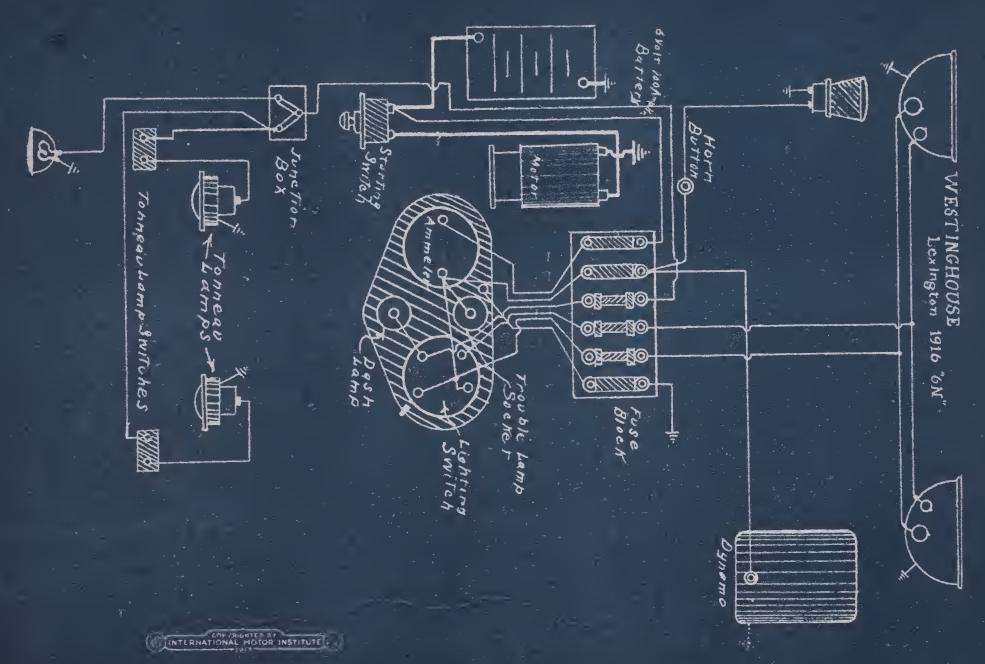


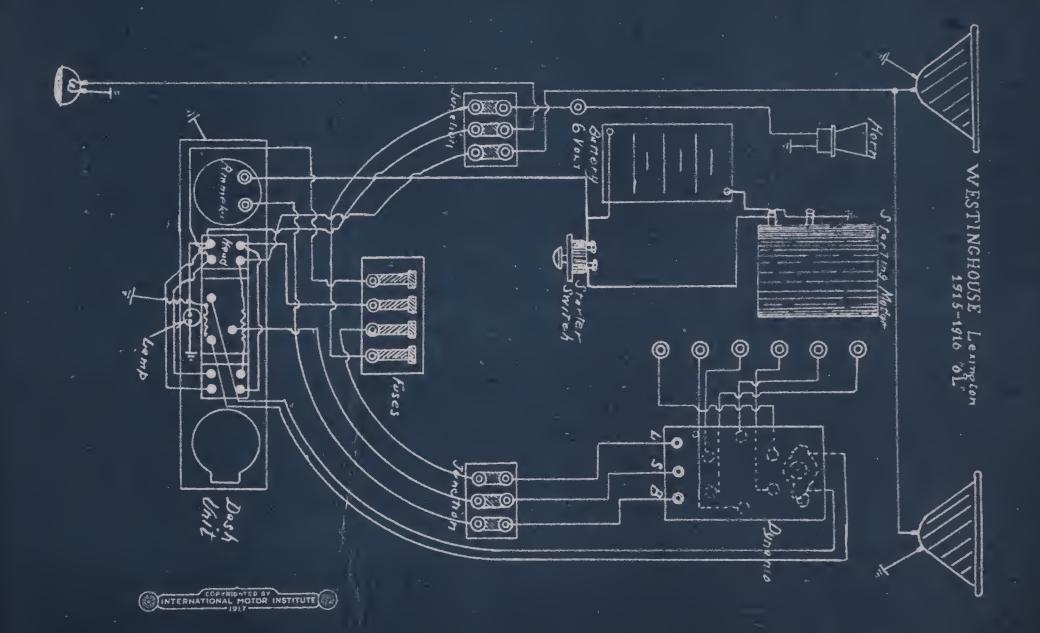


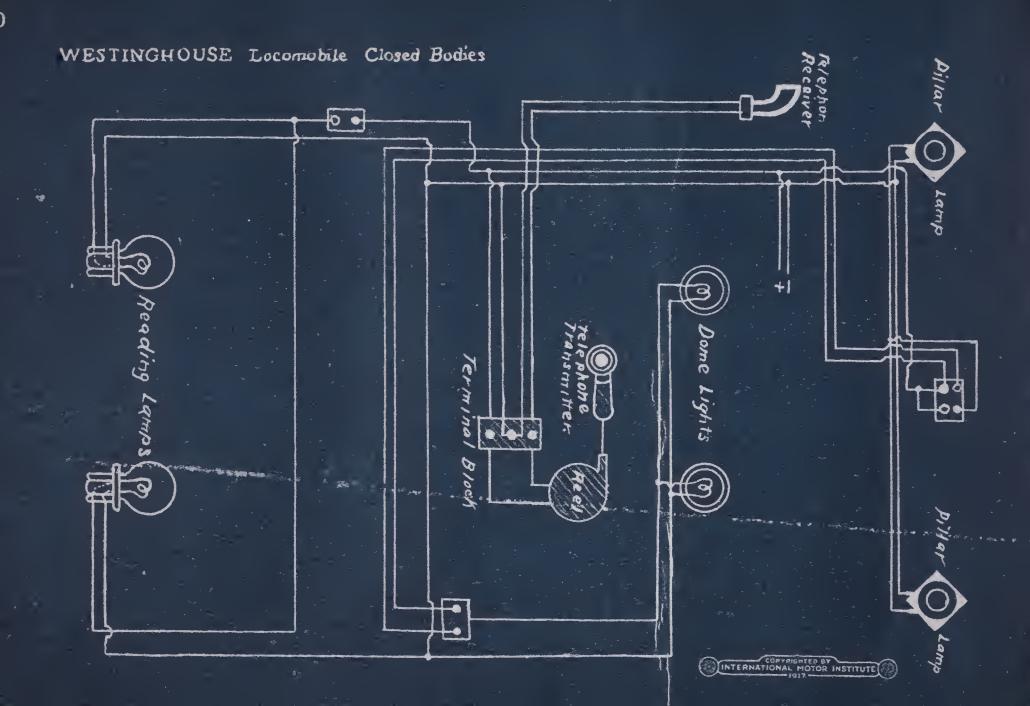


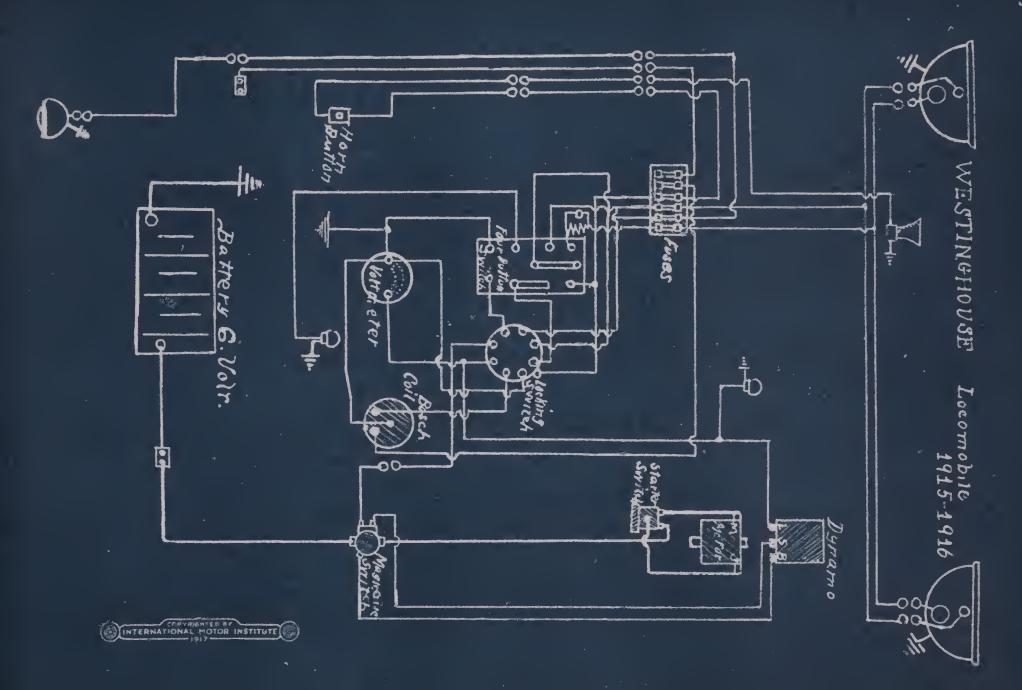


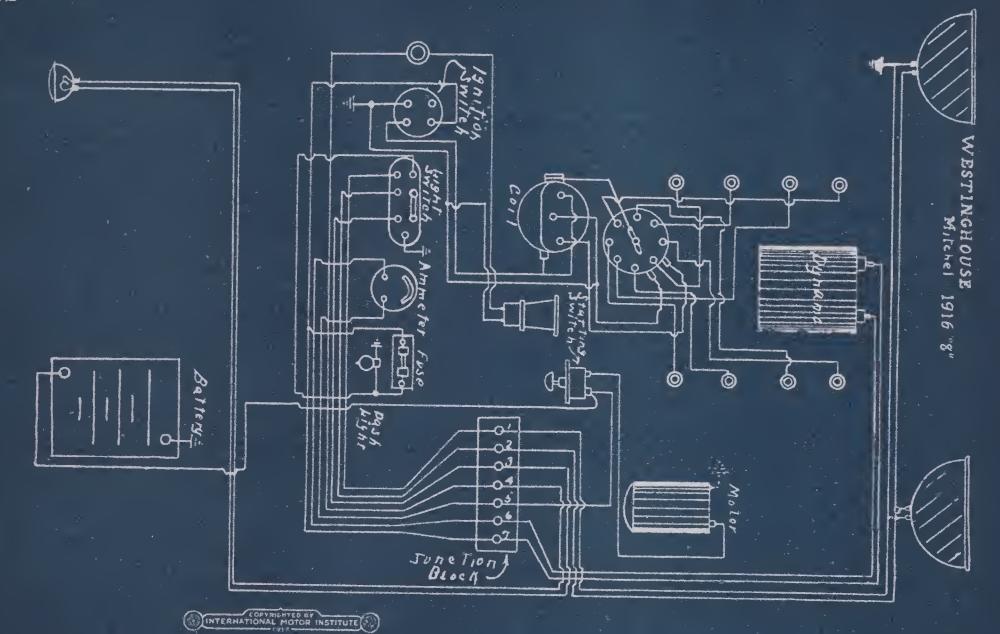


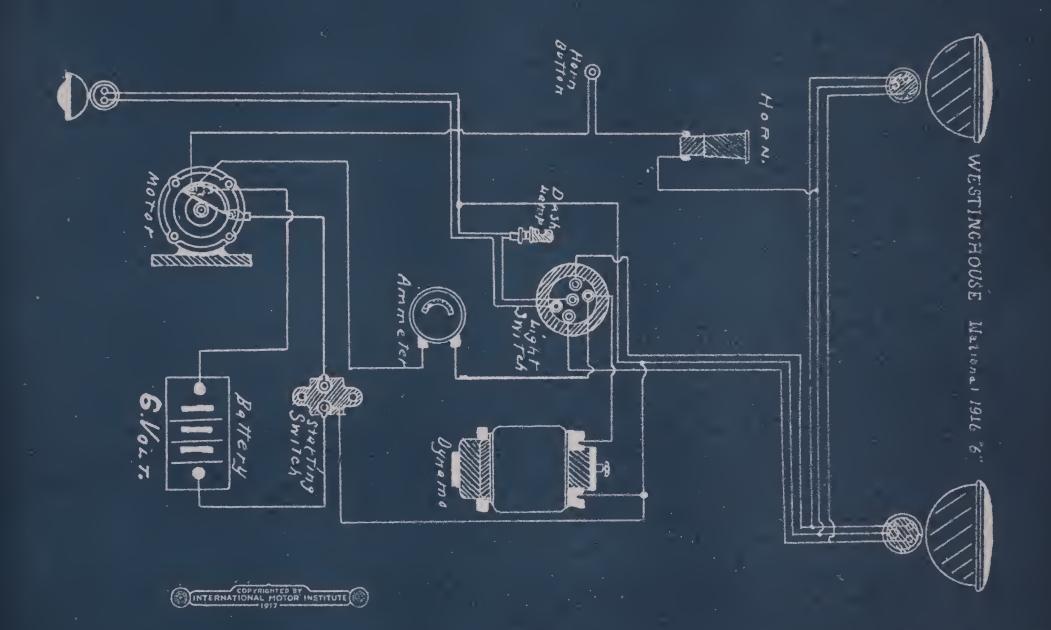


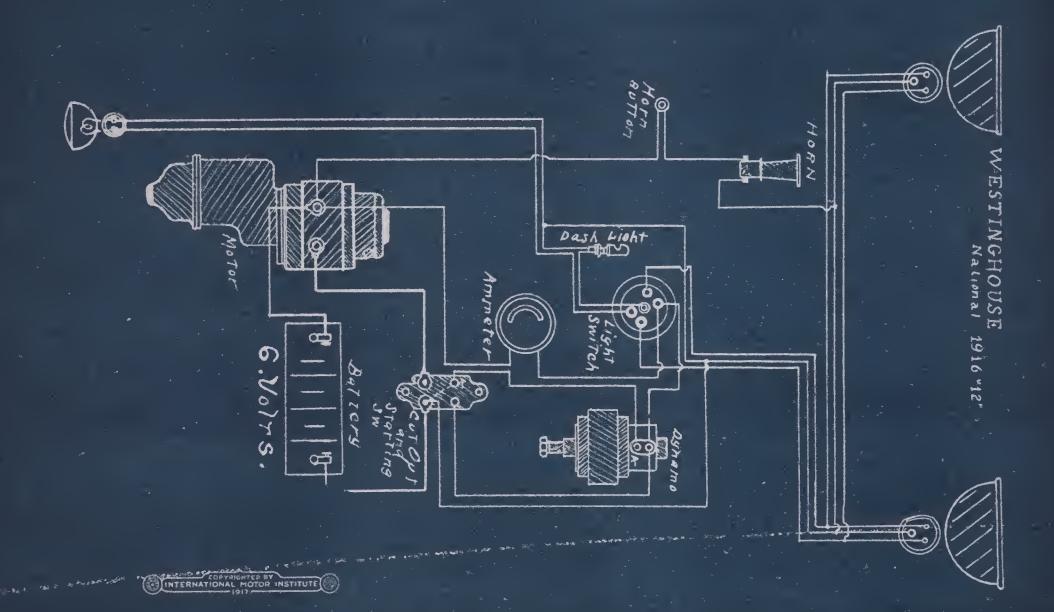


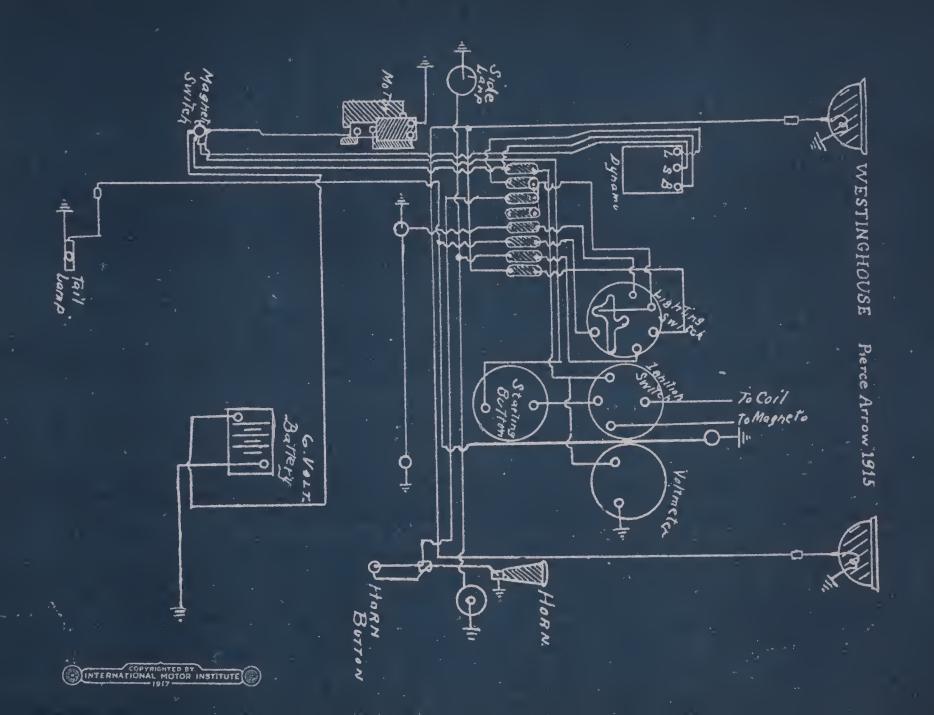


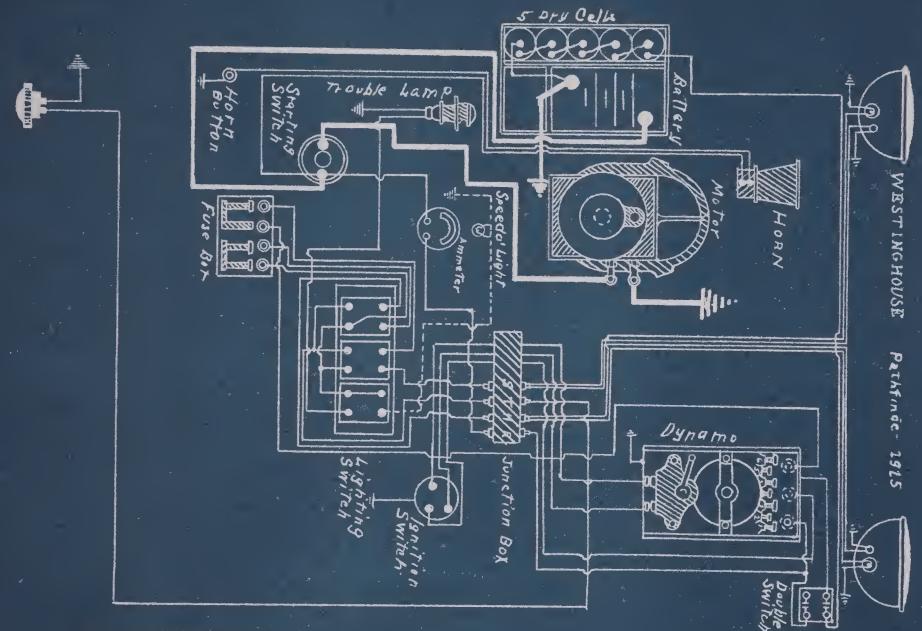


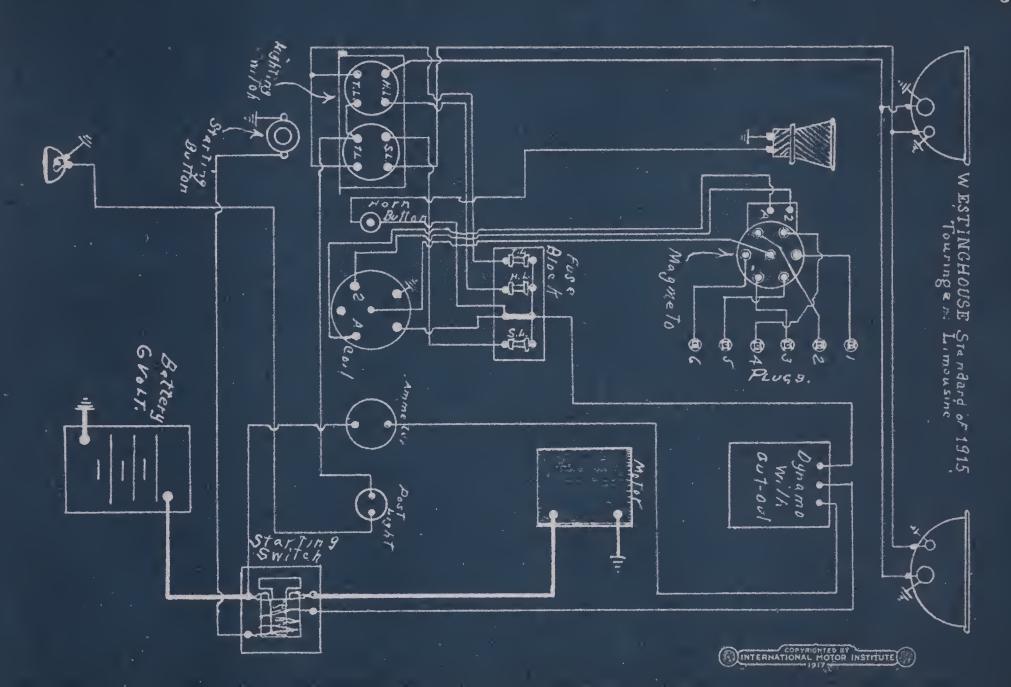


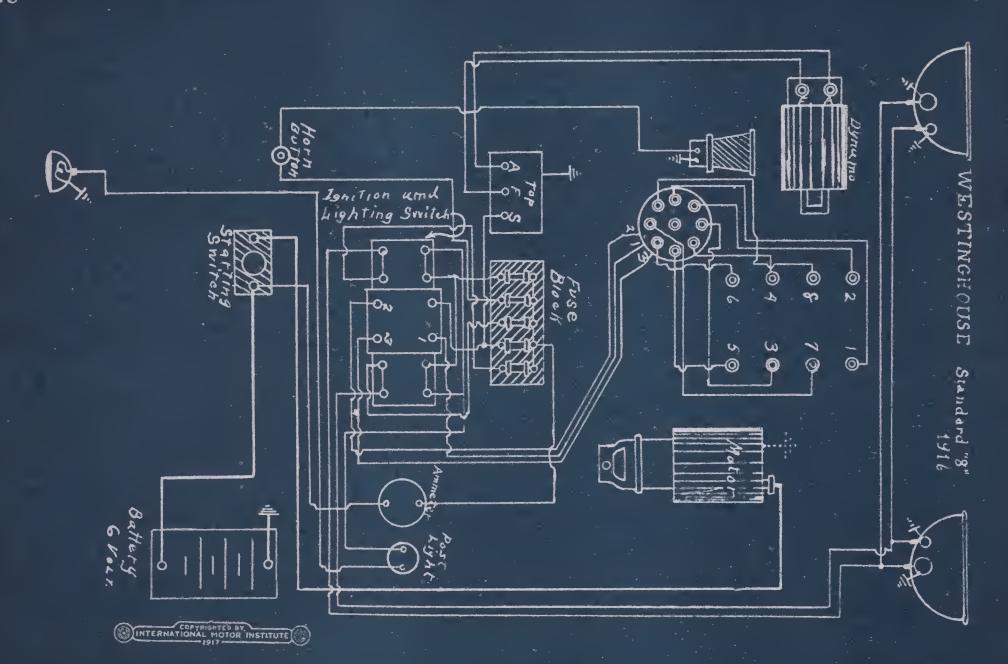


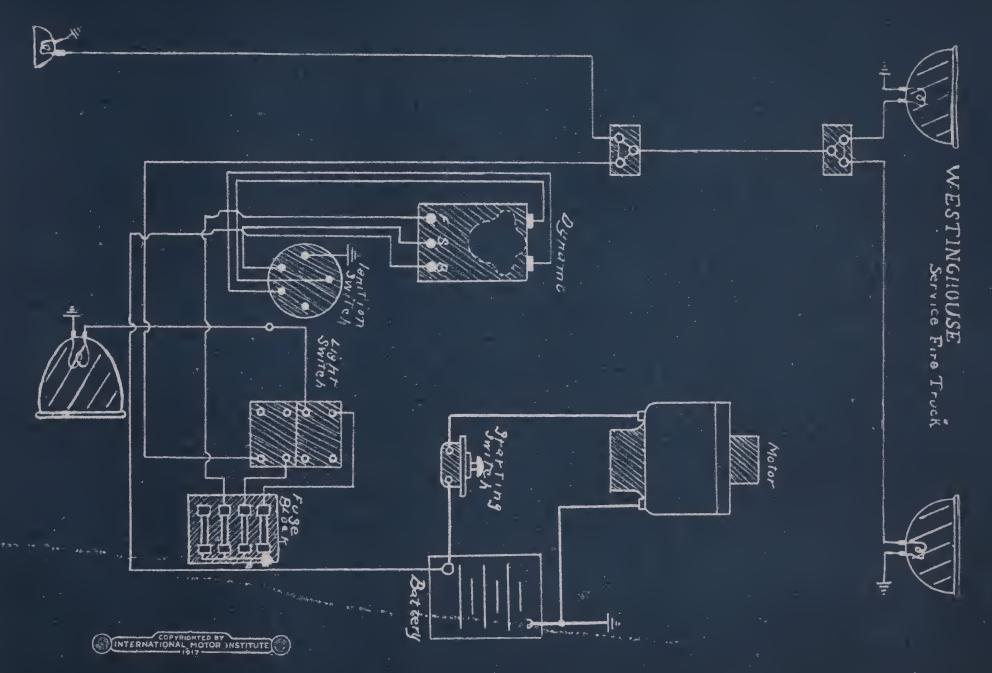


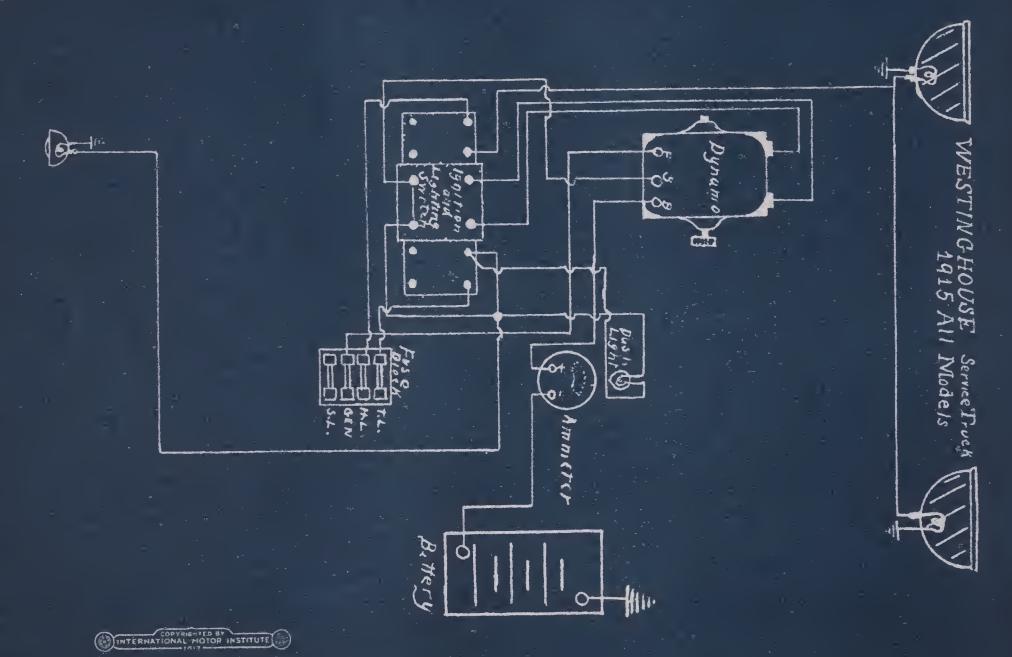


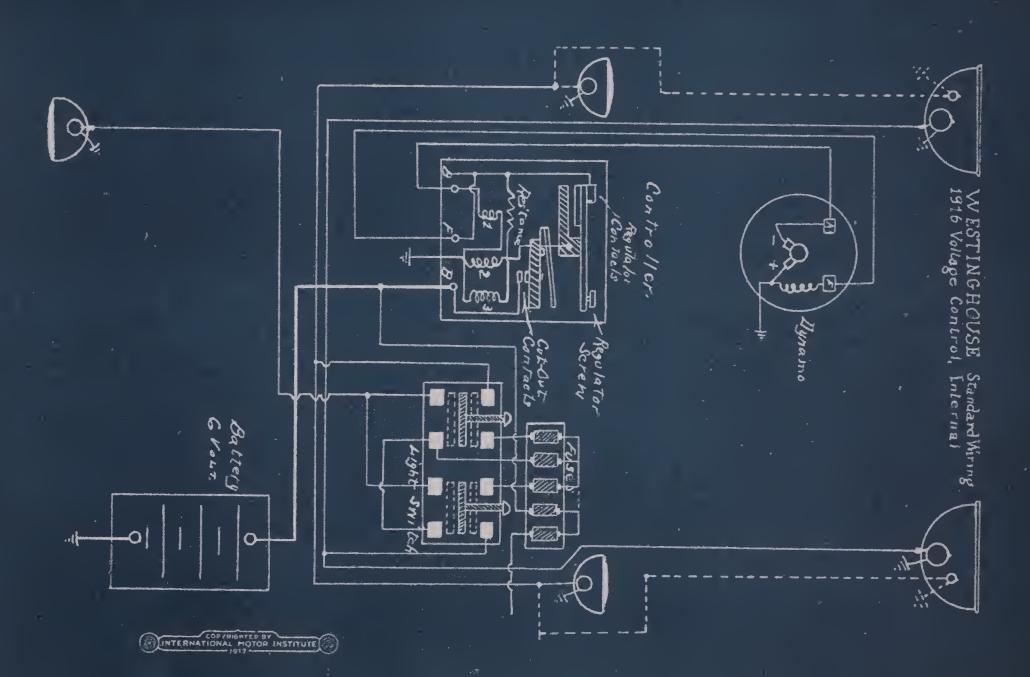


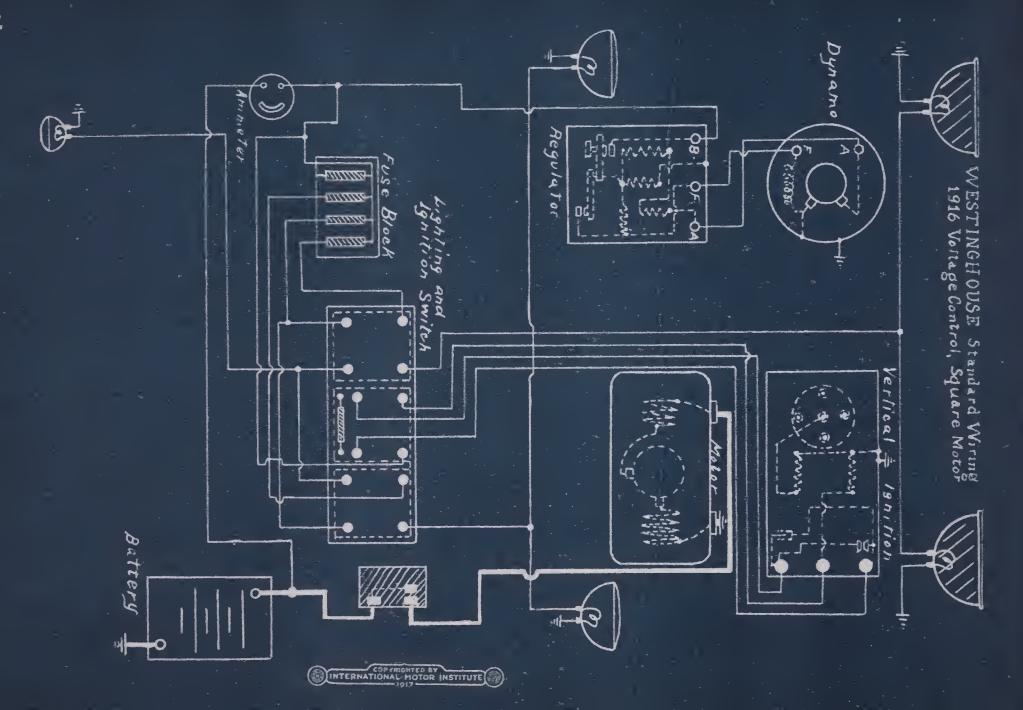


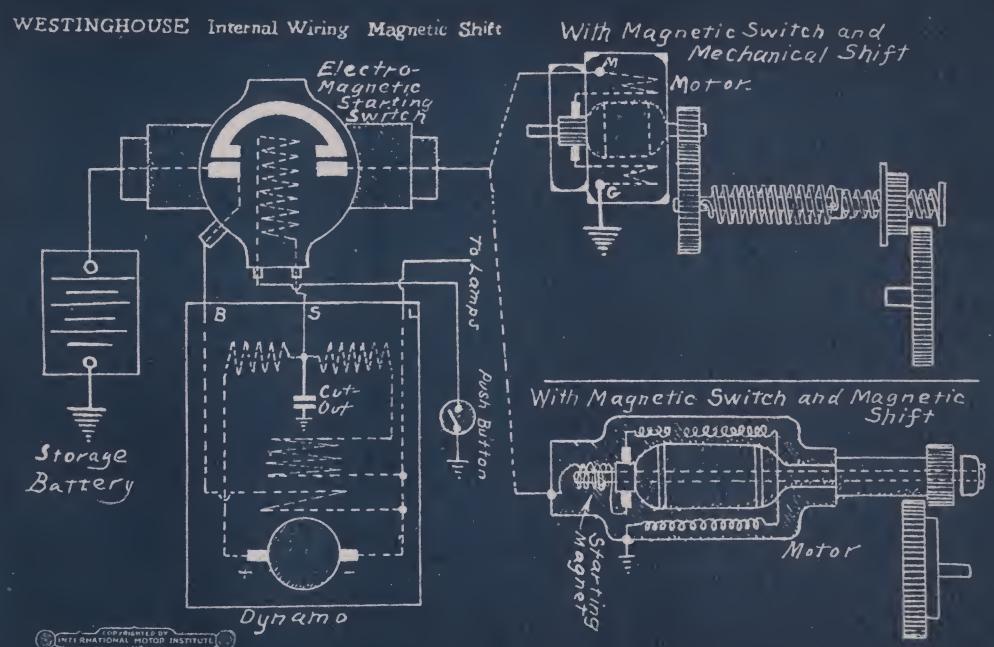


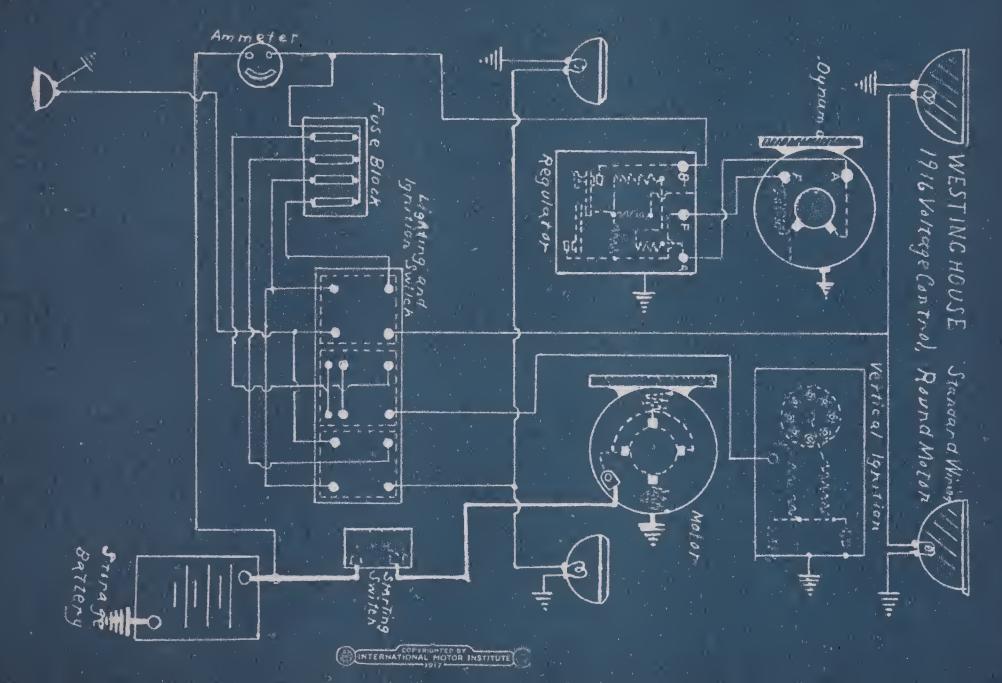


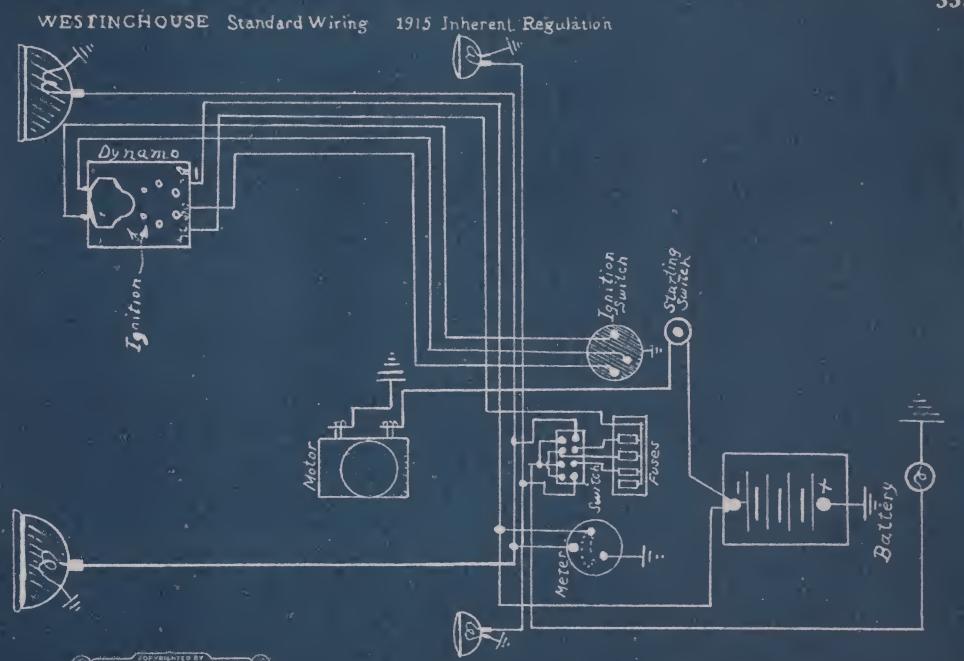




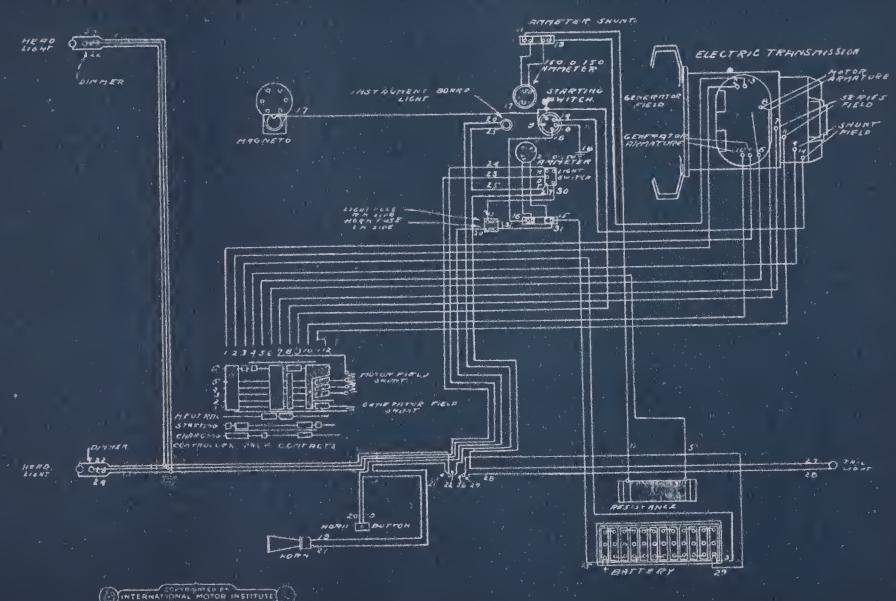


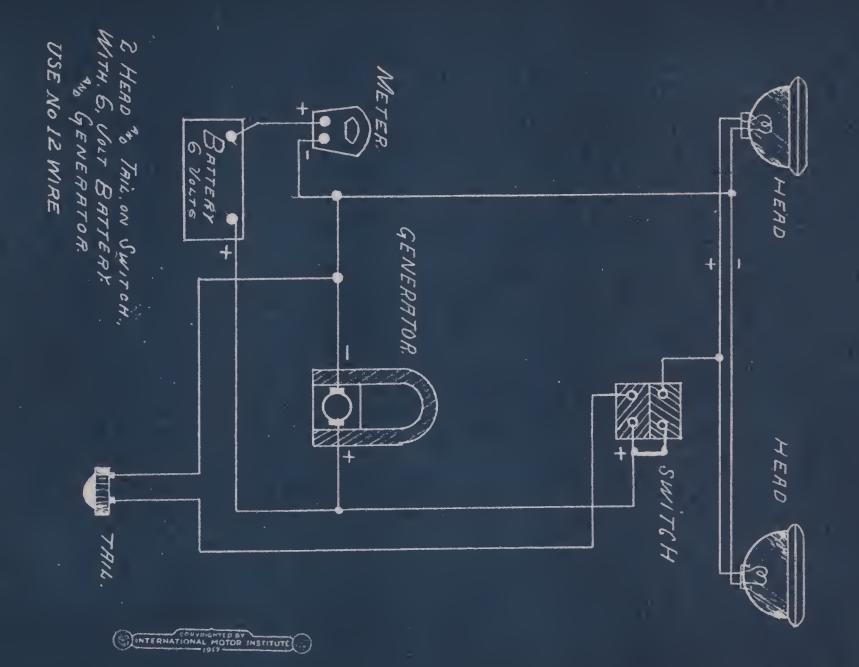


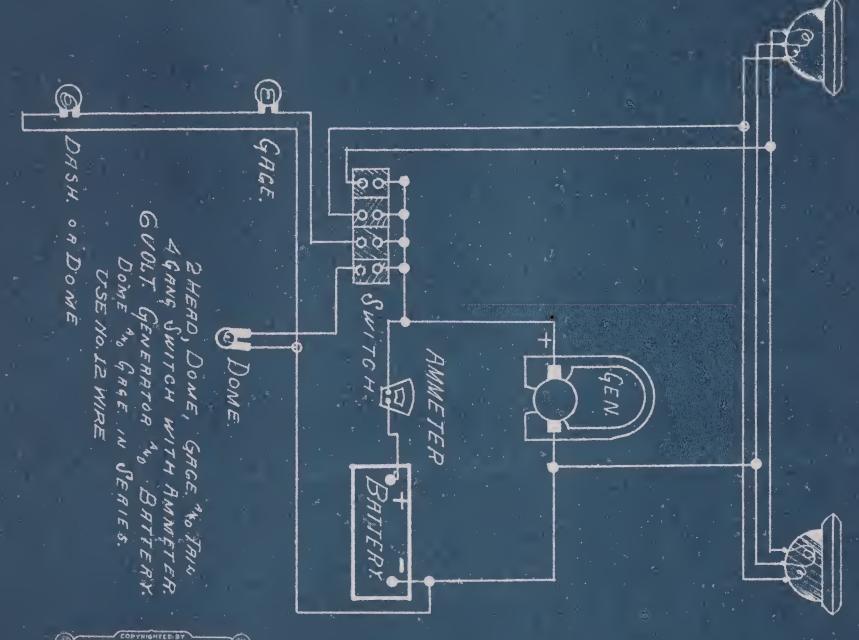


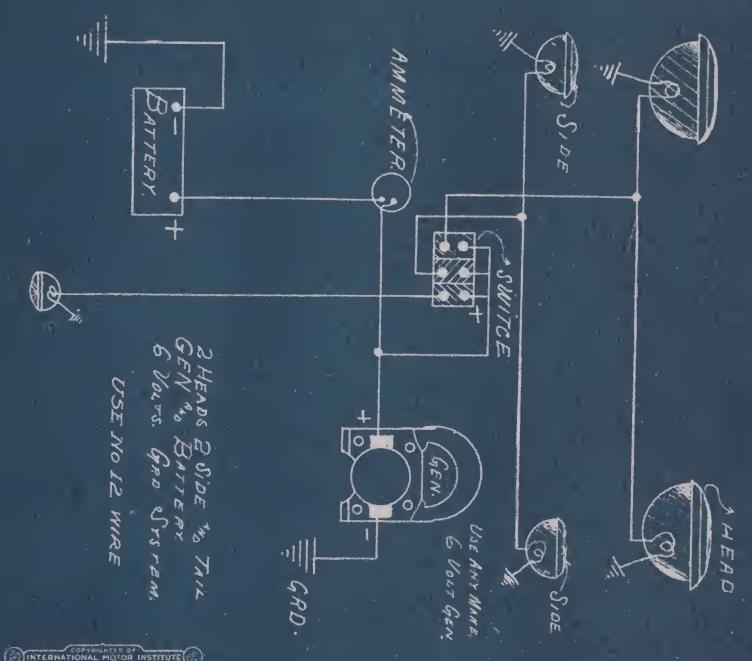


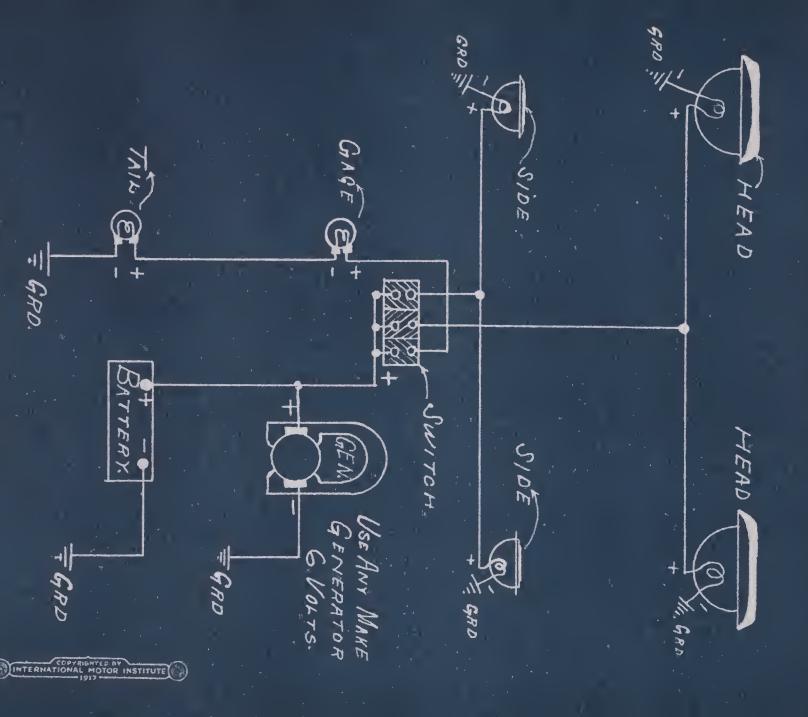
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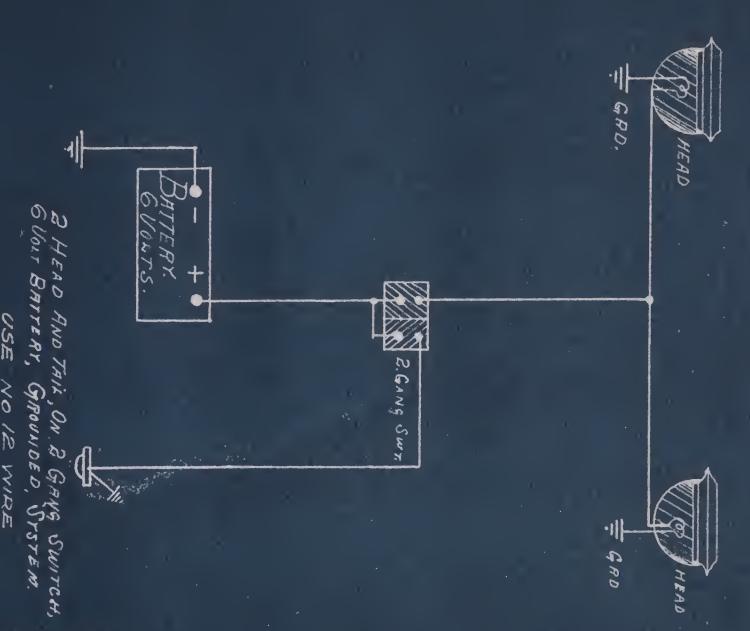




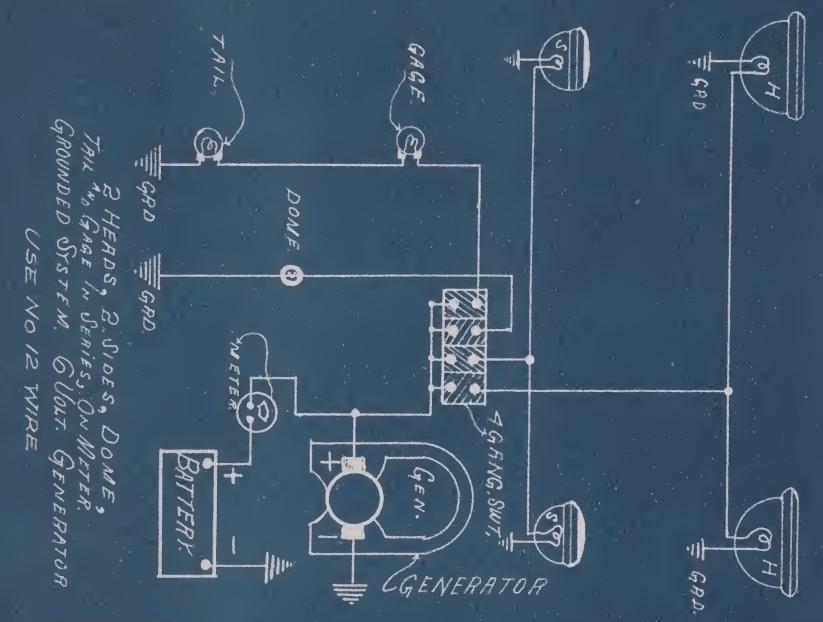


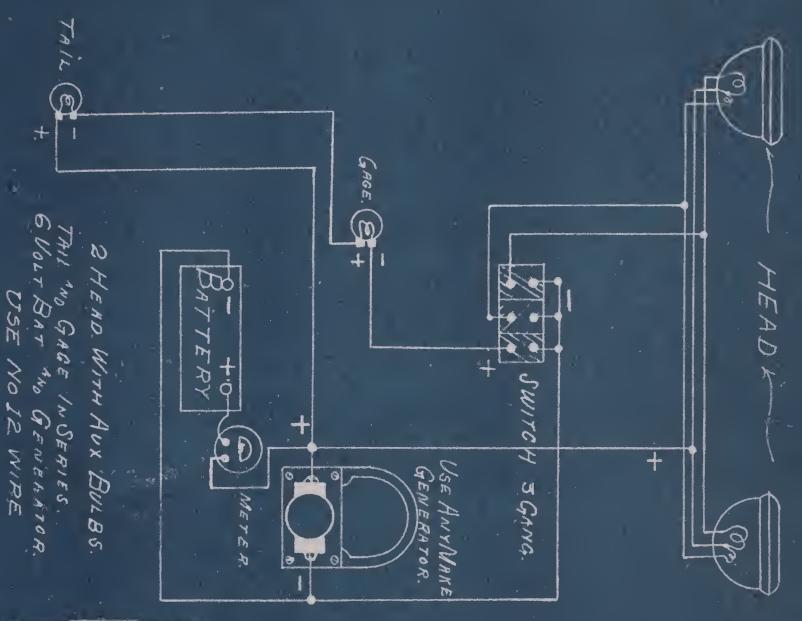


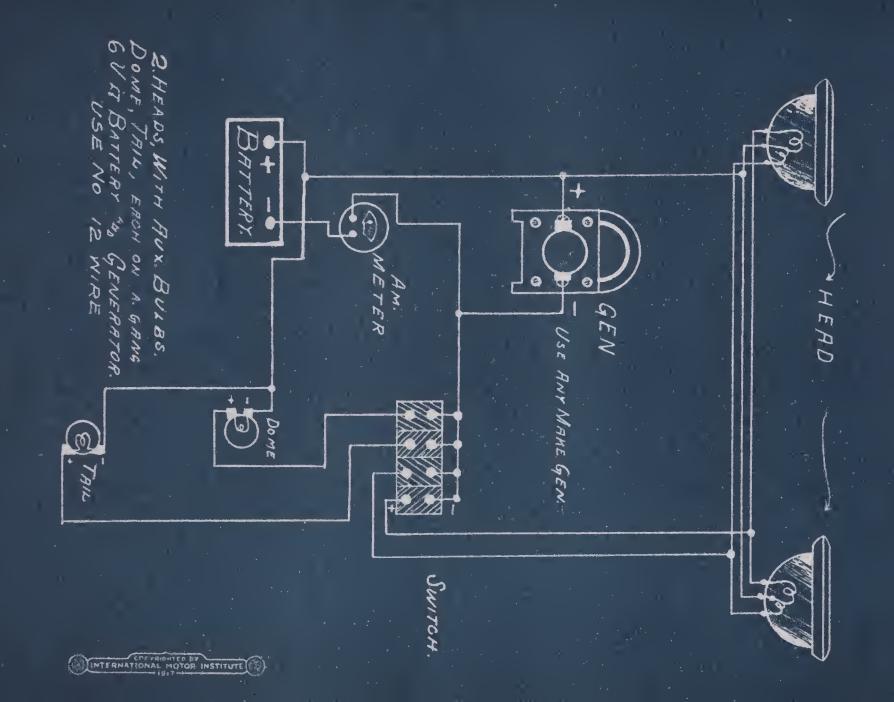


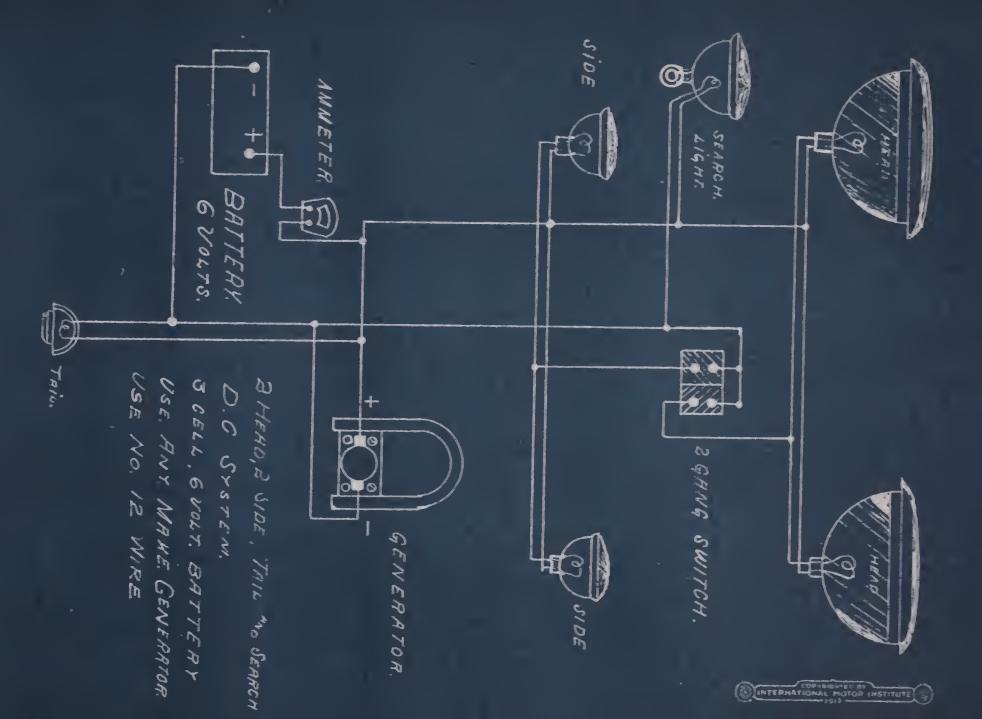


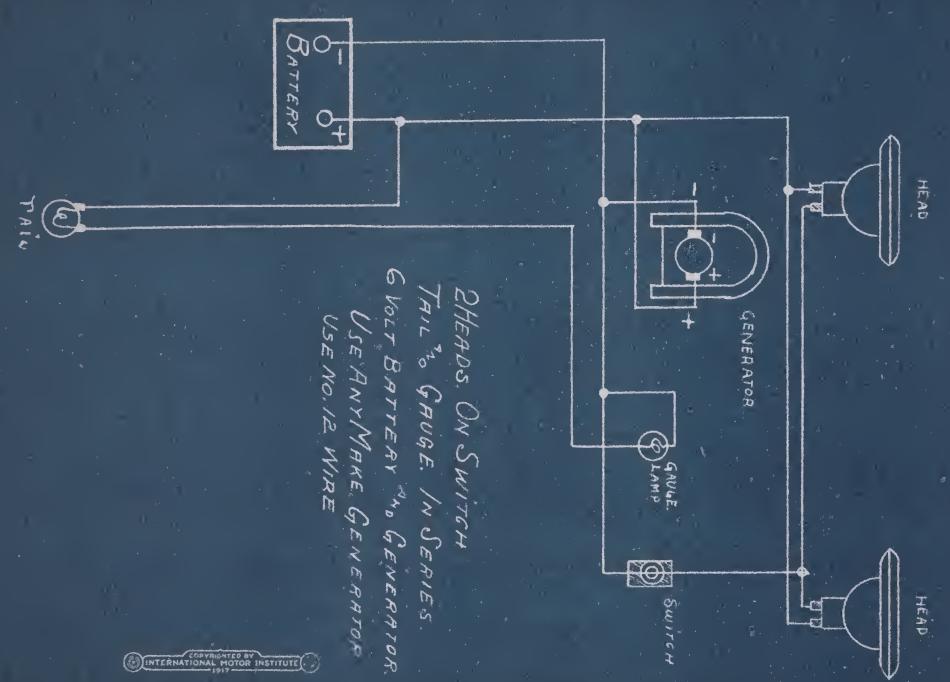


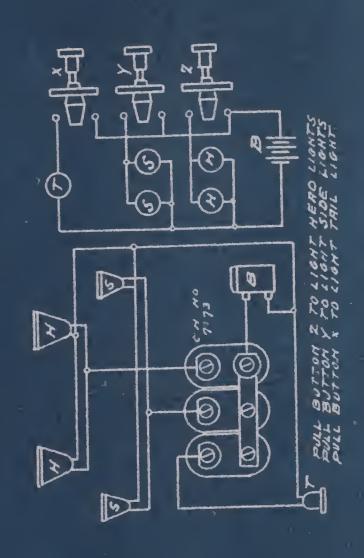




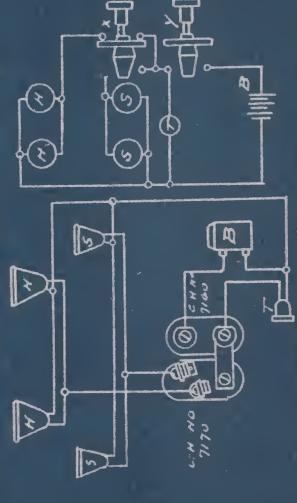






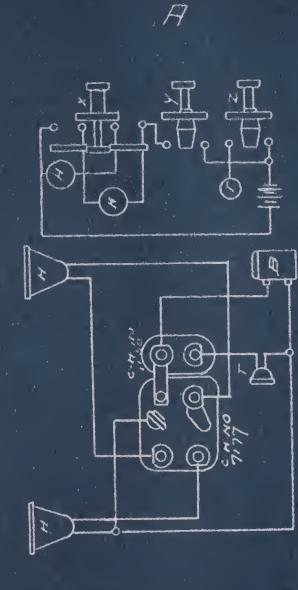


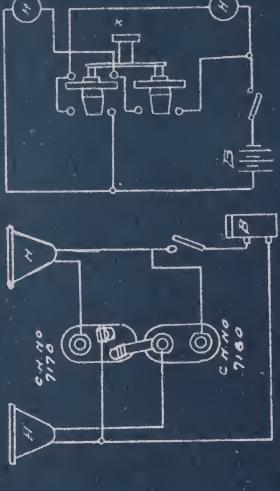
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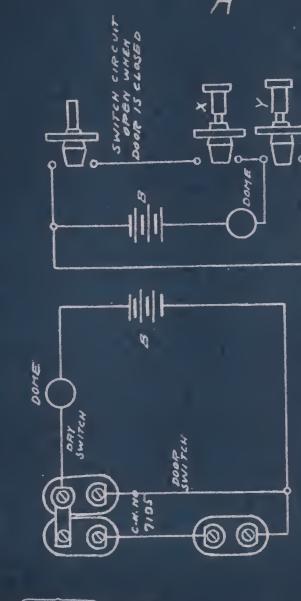
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CONTROL

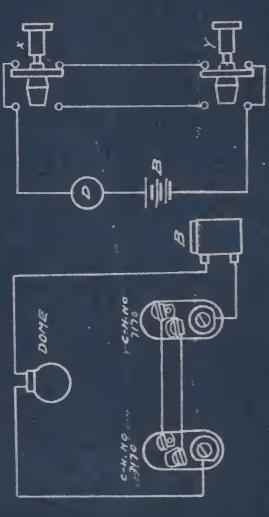


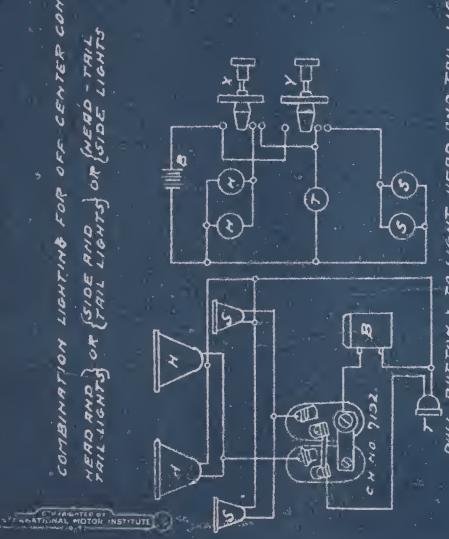


DOME OF DOOR SWITCH CONTROL



OF DOME

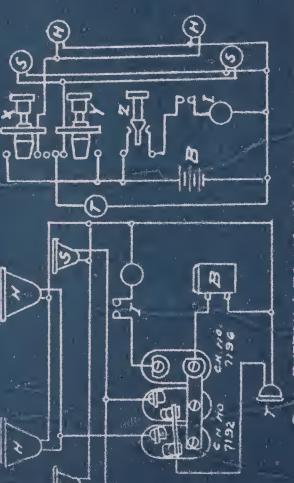


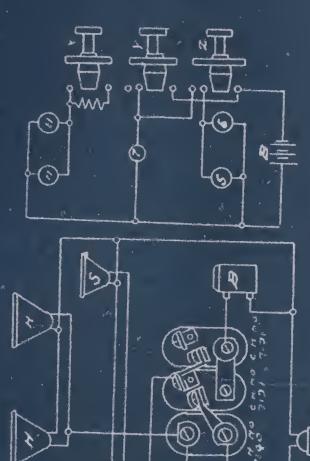


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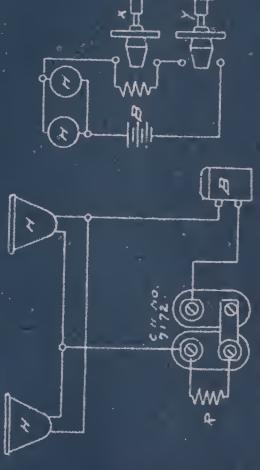
20 TOF

OR





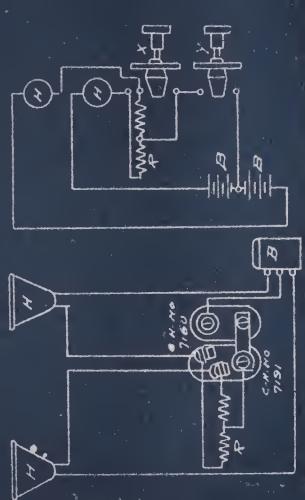
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OF RESISTANCE MEANS HEAD LIGHTS BY 12 1017

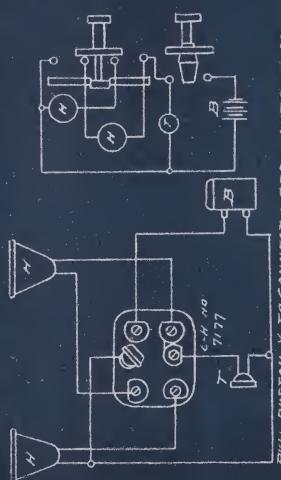
GVOLT



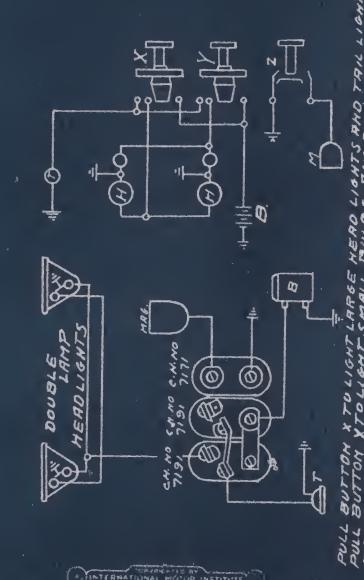
STEPHEN SHAP SHAP SHAPE

BUTTON X TO LIGHY PULL

CONTROL SERVES



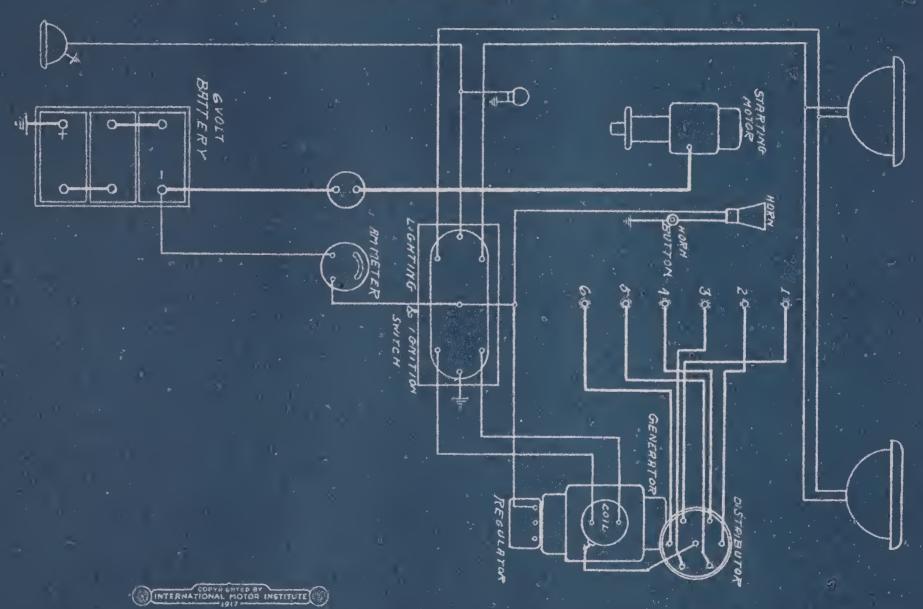
COMBINATION LIGHTING - GROUNDED SYSTEM.

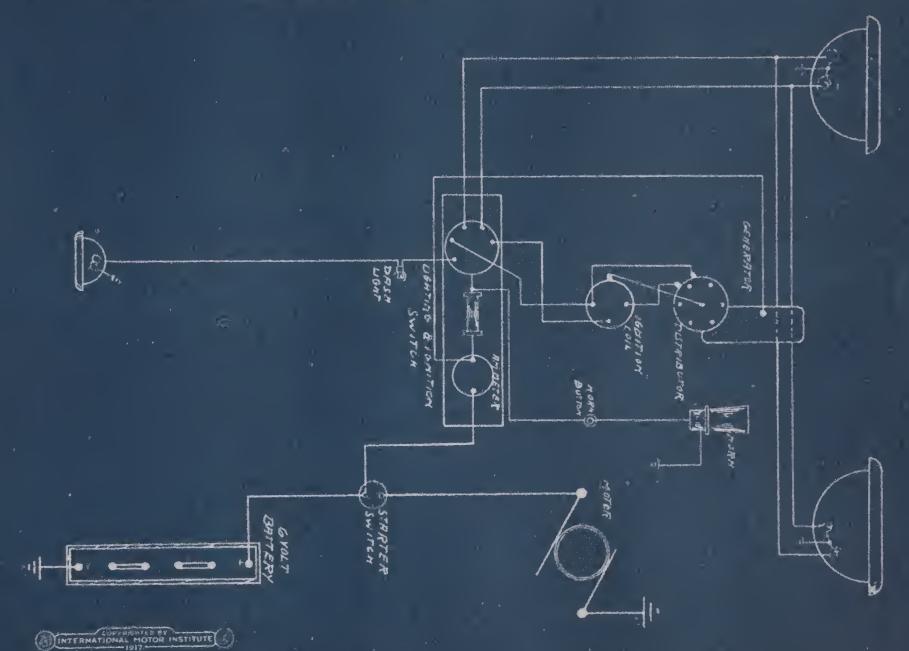


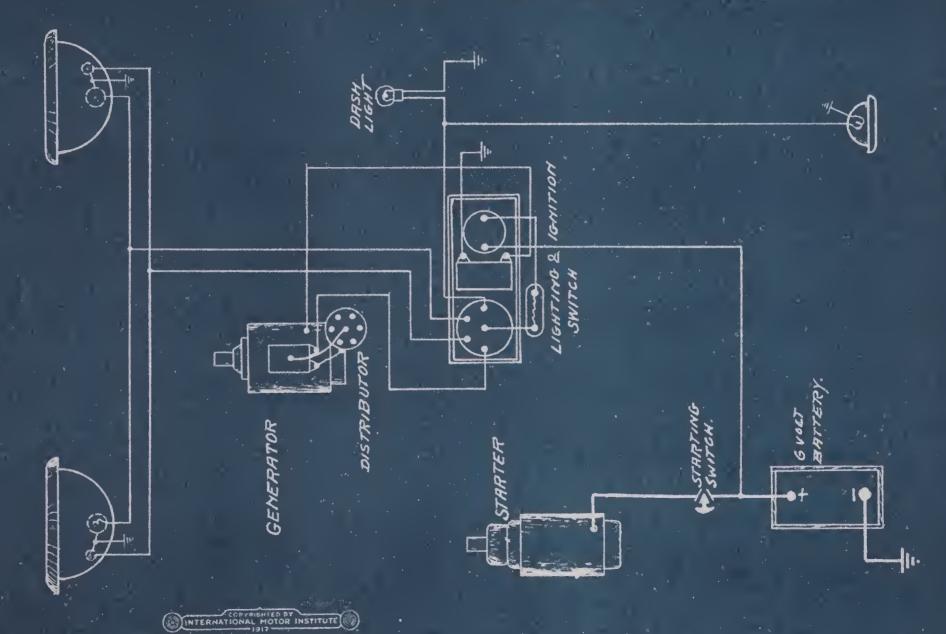
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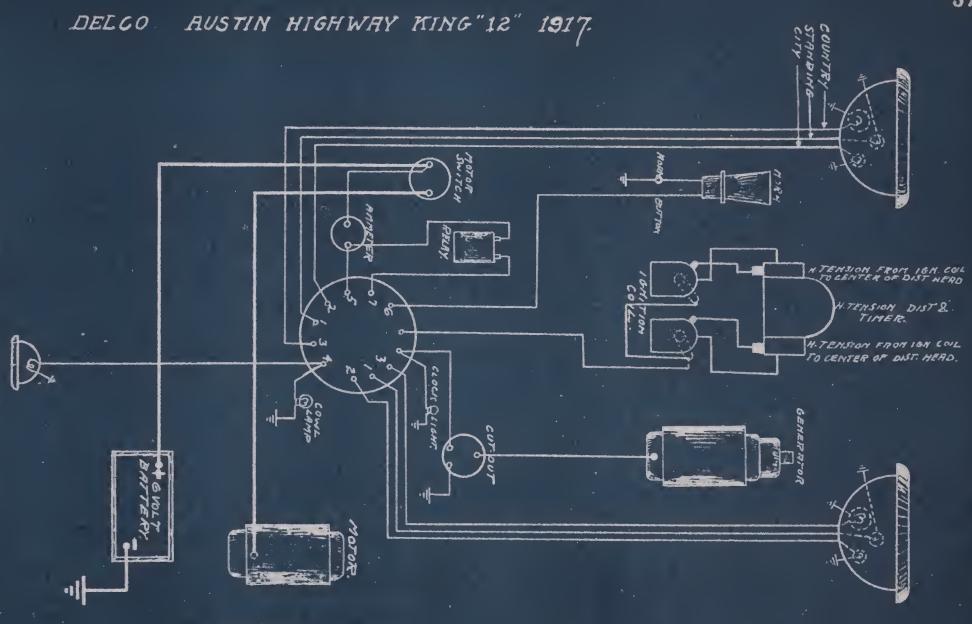
(10) (O)

REMY ABBOTT-DETROIT MODEL "6 44" 1916

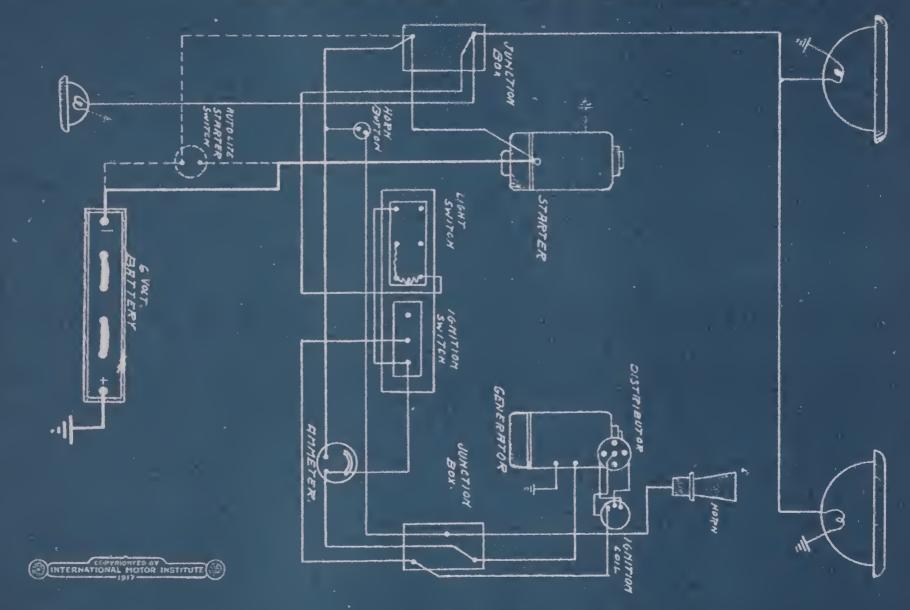




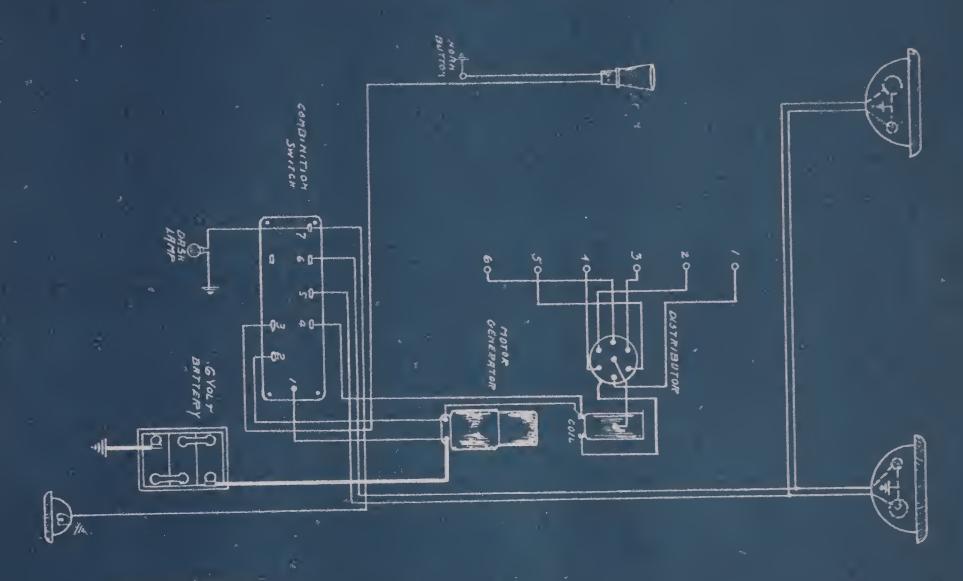




BRISGOE 1917" MODEL 4 24 CHANGES IN WIRING FOR AUTO-LITE SYSTEM SHOWN IN DOTTED LINES

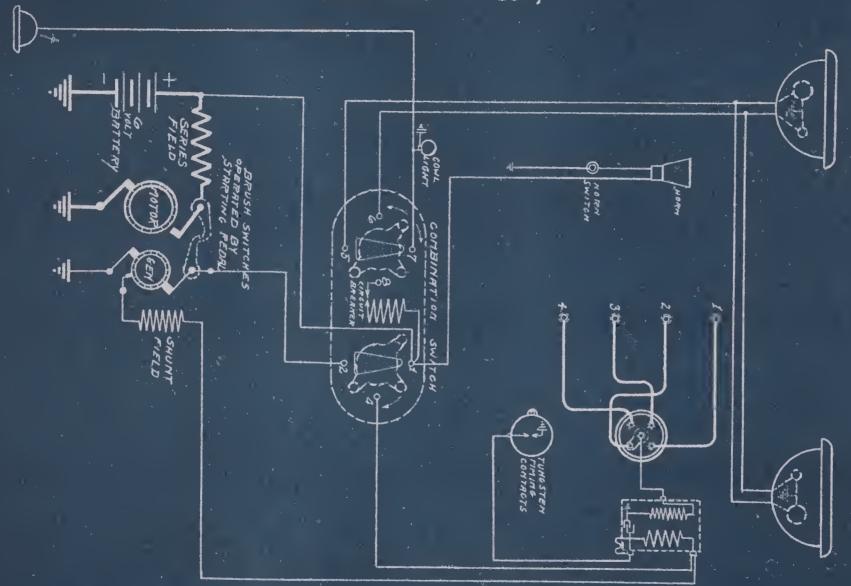


DELGO BUICK D-44,45.46,47. 1917.

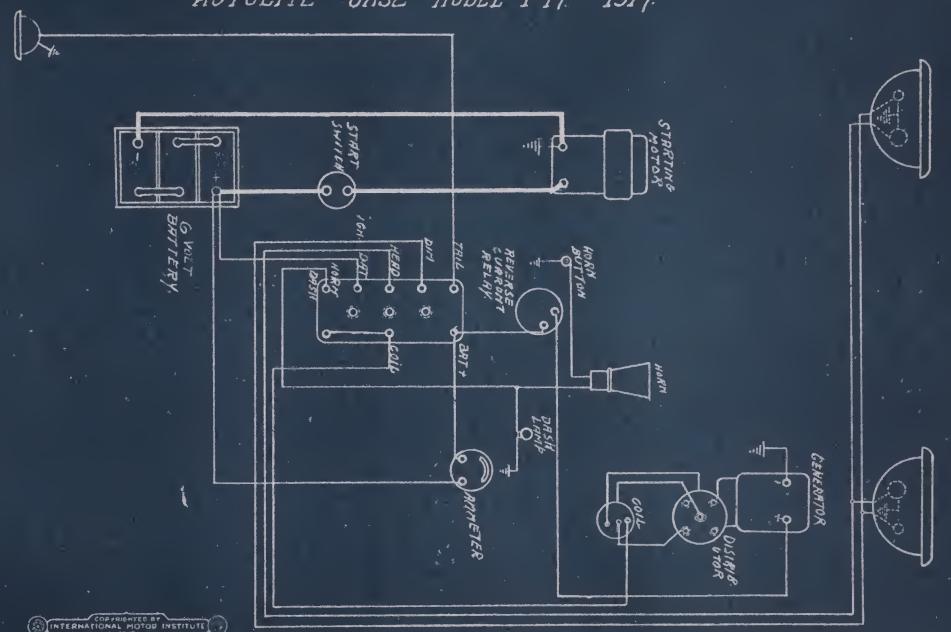




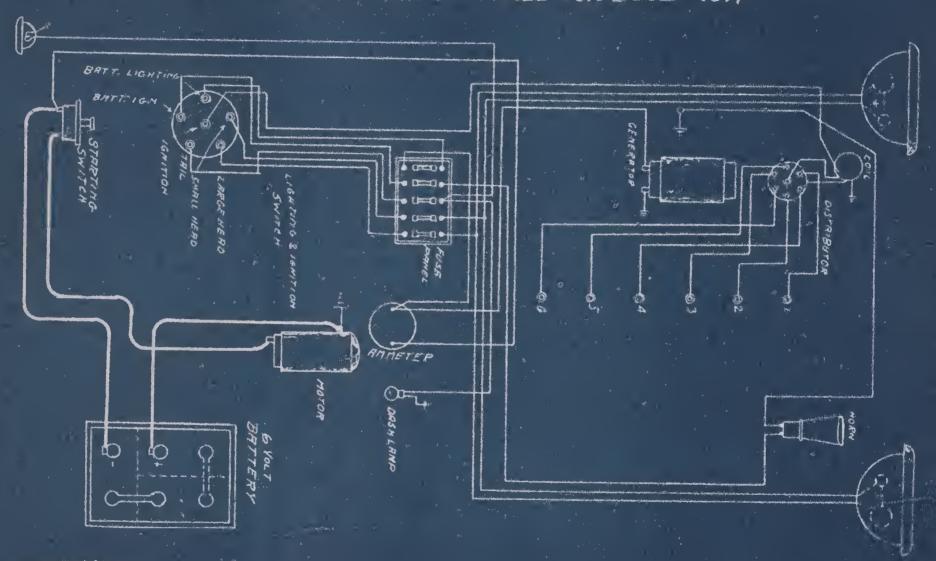
DELCO: BUICK MODEL D-34-35 1917.



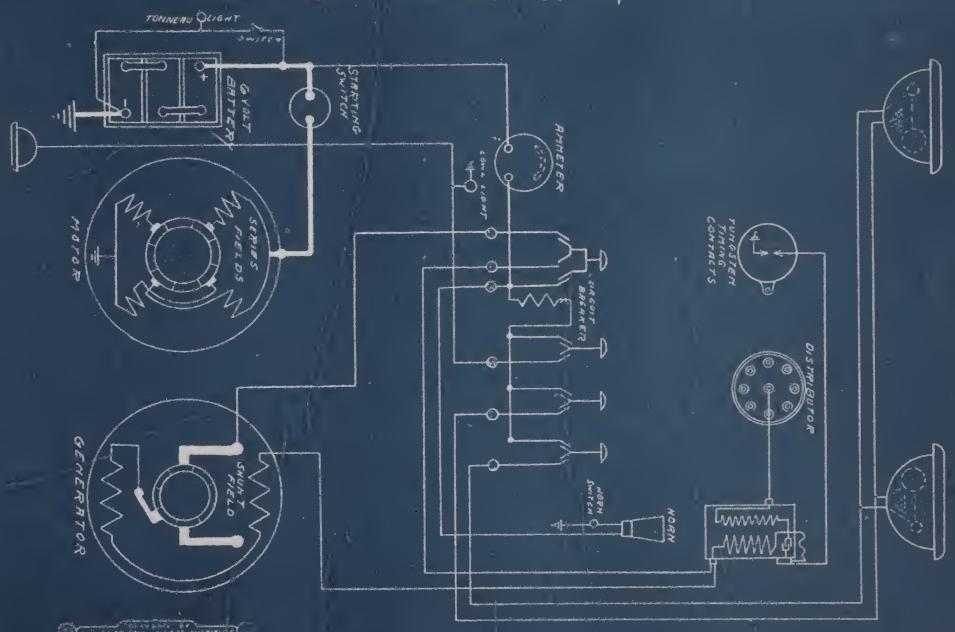
AUTOLITE GASE MODEL T-17. 1917.

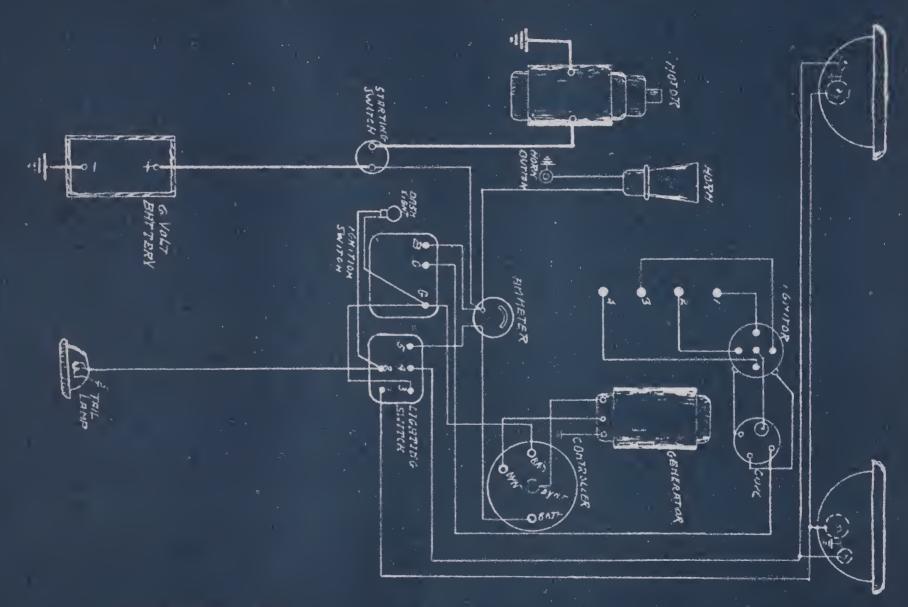


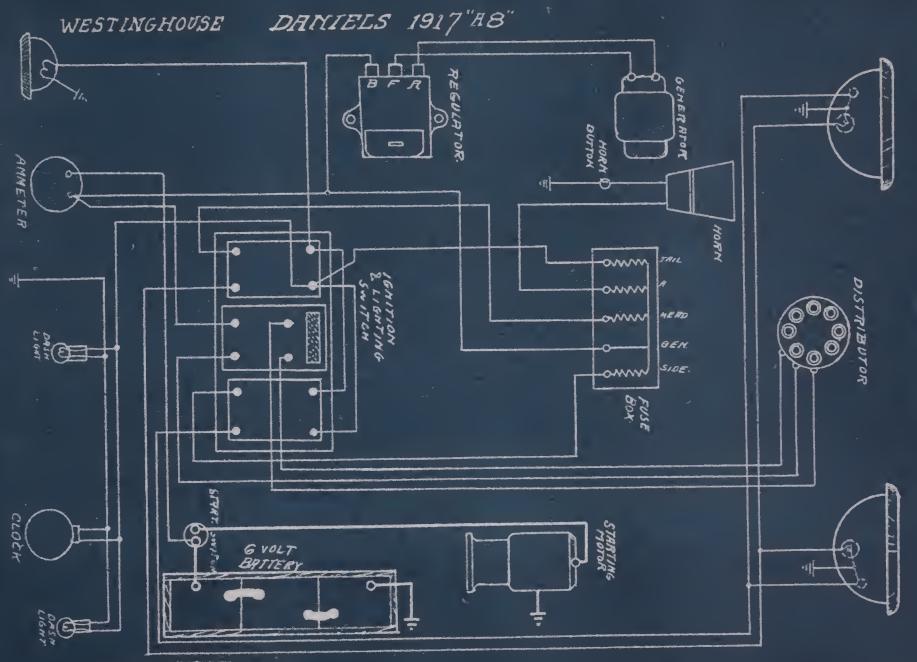
WESTINGHOUSE CHALMERS SIX 30" MODEL 35A 235B 1917

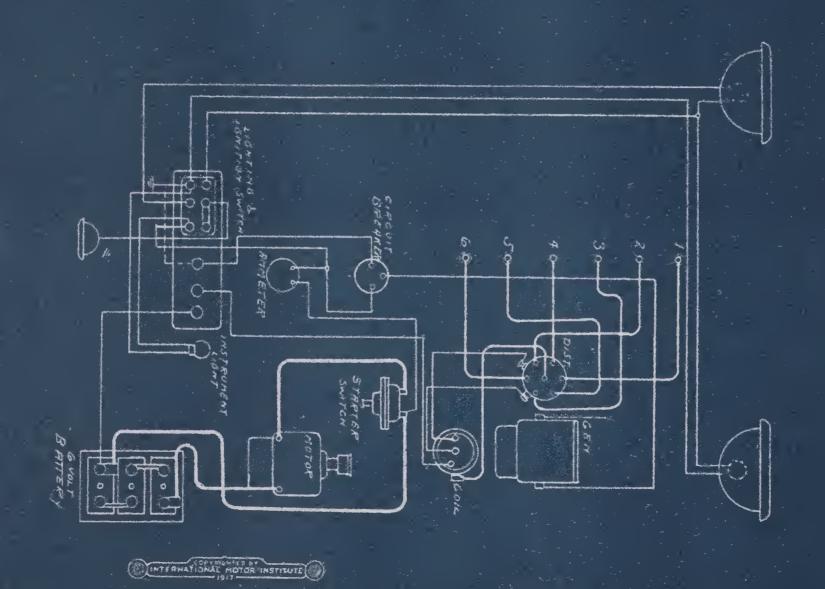


DELCO COLE MODEL 860,1,23,4, 1917

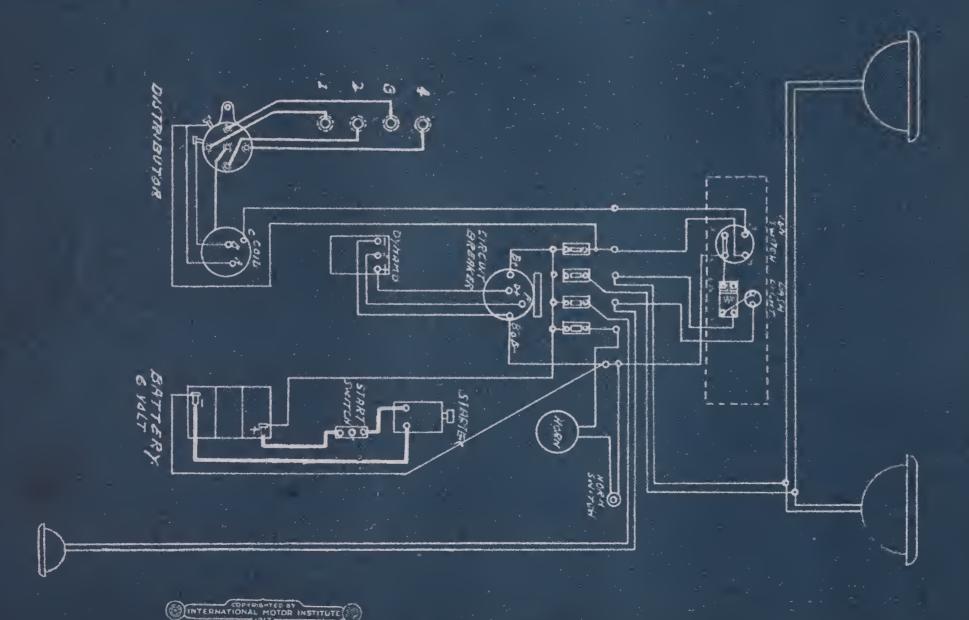




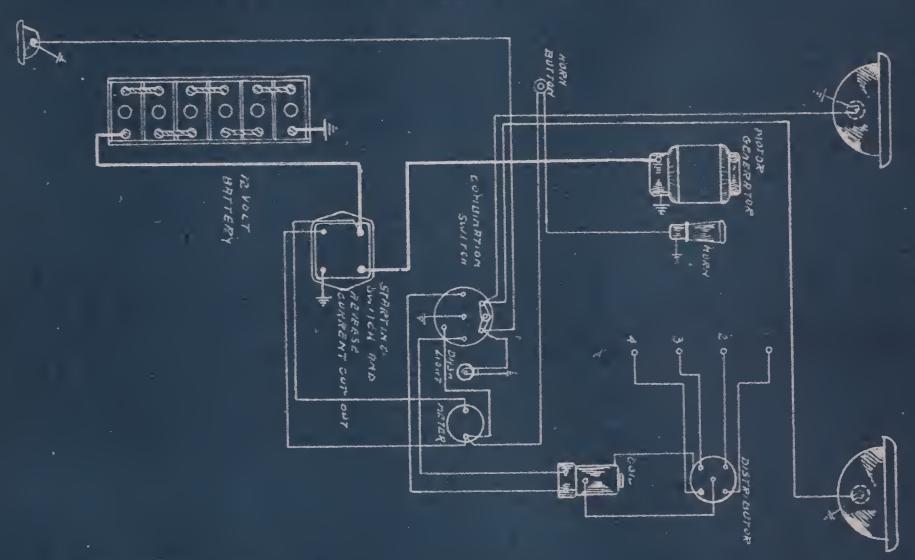


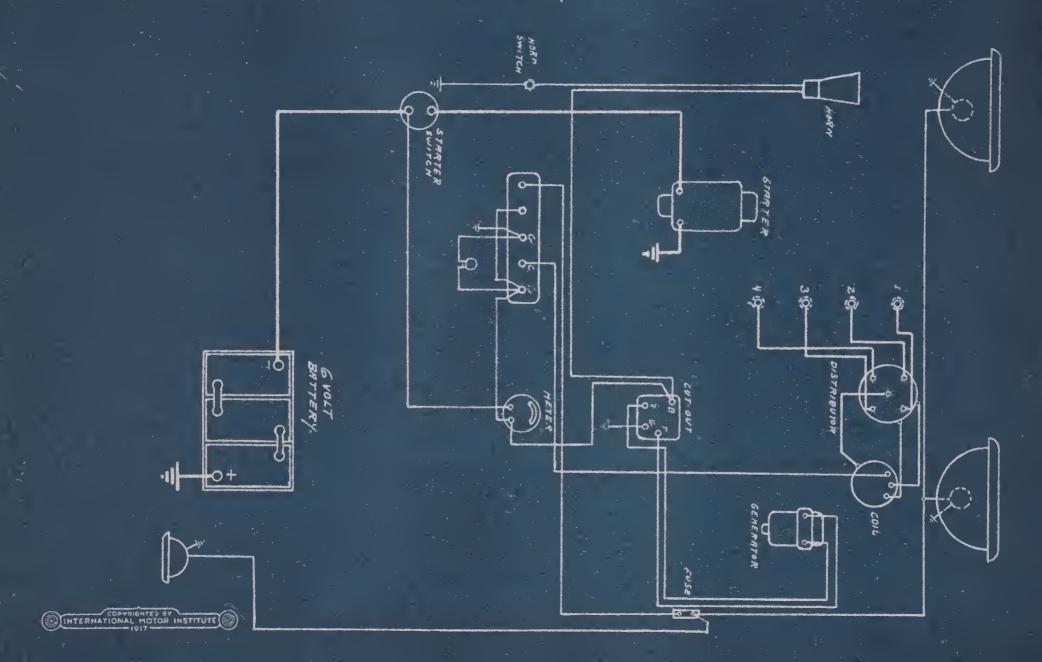


AUTOLITE DETROITER MODEL 6-45 1917 INTERNATIONAL MOTOR INSTITUTE

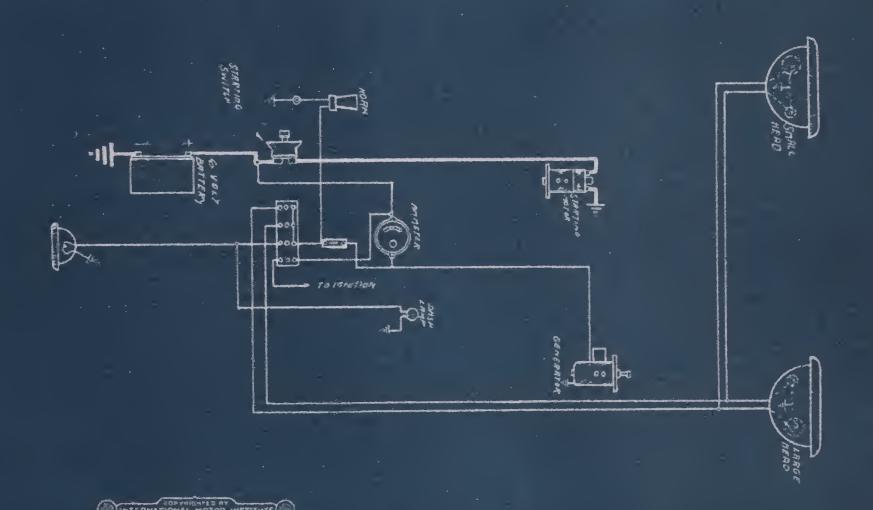


NORTHEAST DODGE 1917. MODEL "30"

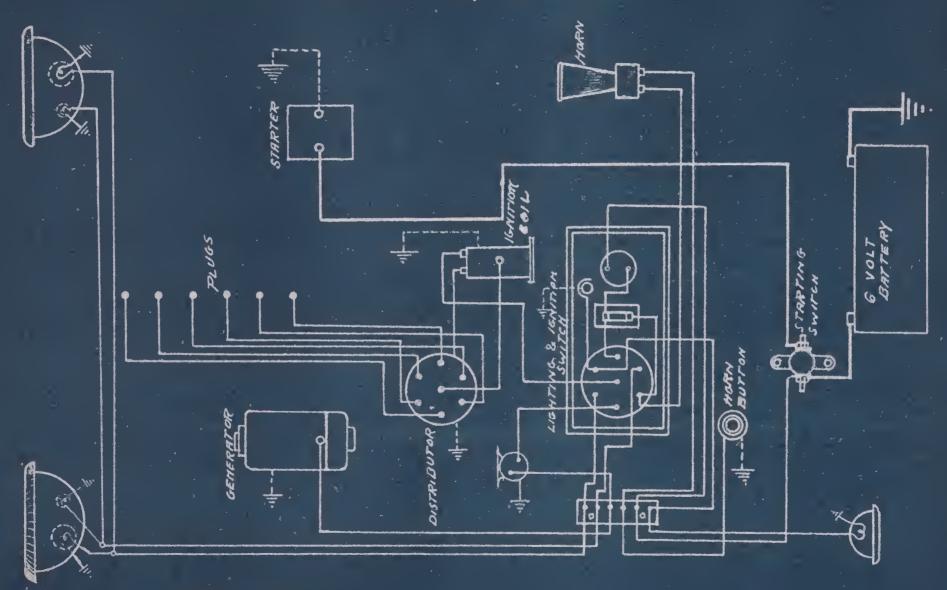




DYNETO ELCAR MODELS-D,E,F&G 1917



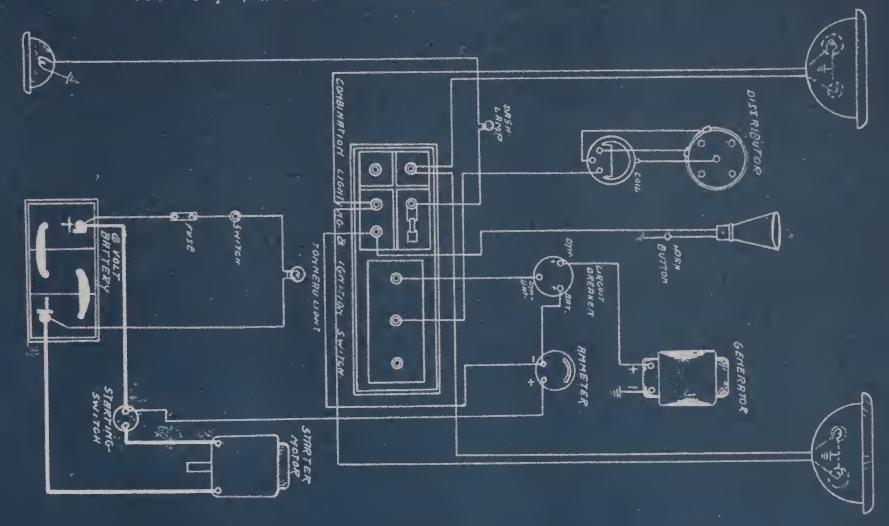
WAGNER ELGIN 1917. MODEL "17-6"



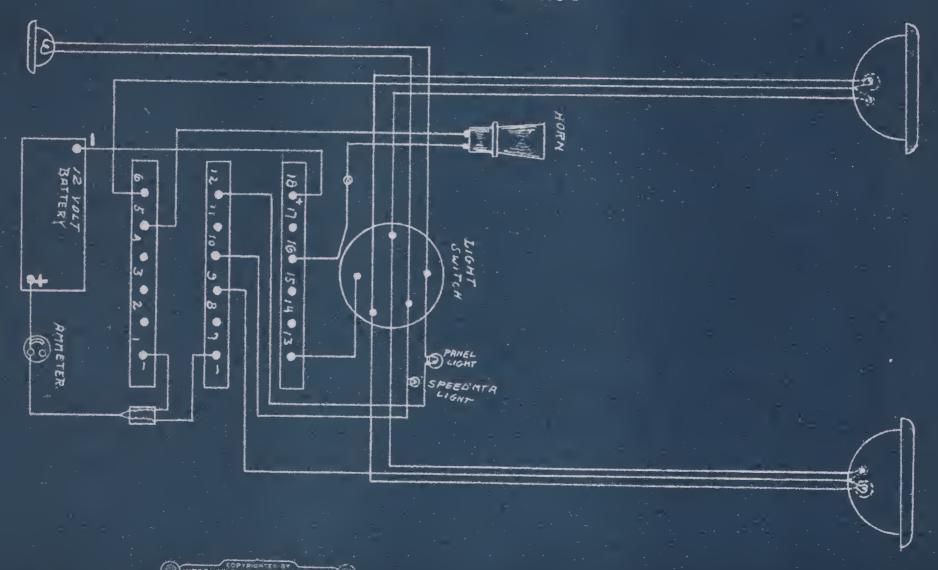


AUTOLITE EMPIRE MODEL 50-70-70A. 1917

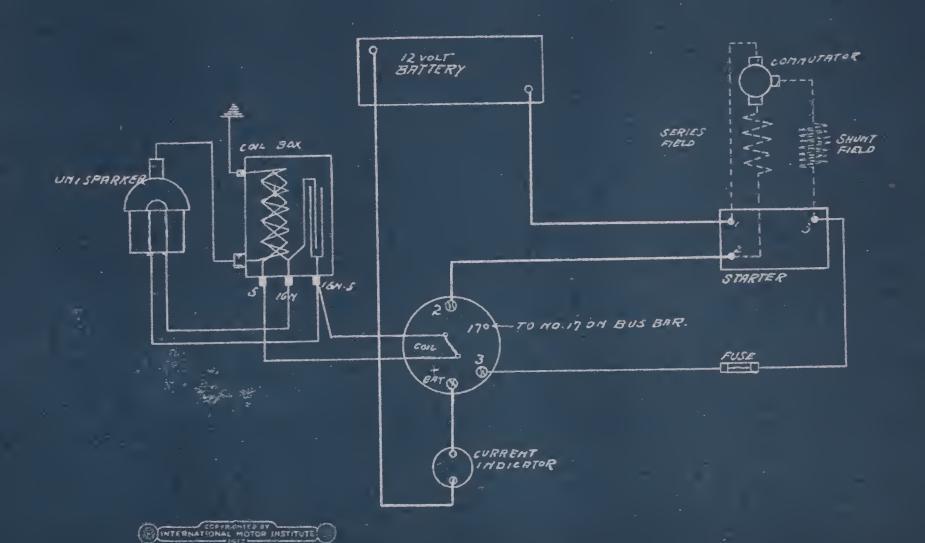
FOR NOD. 70-70A, G CABLE DISTRIBUTOR IS USED



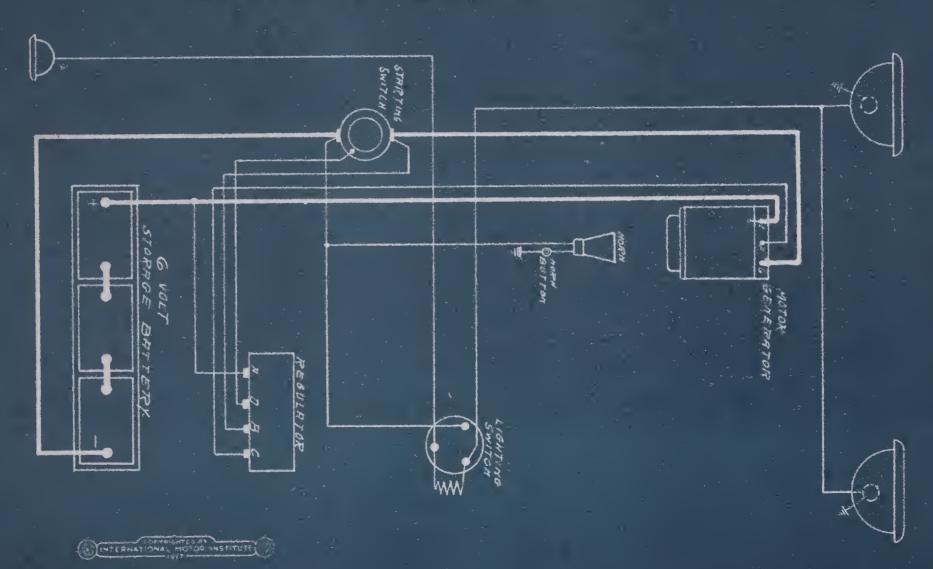
DYNETO FRANKLIN SERIES 9 1917. LIGHT & HORN WIRING

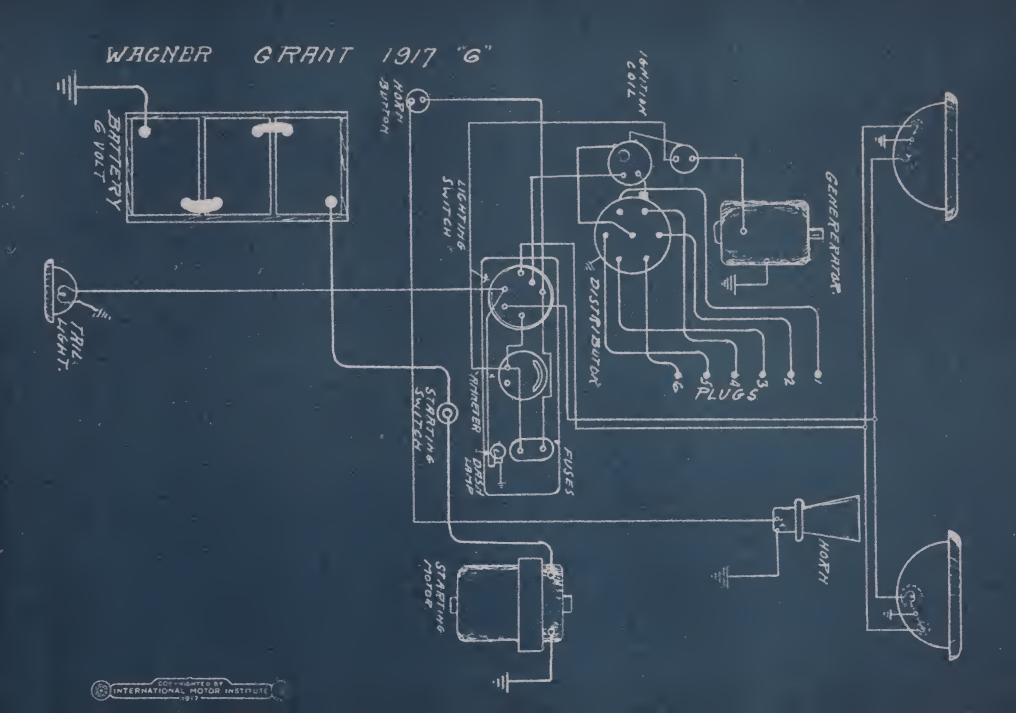


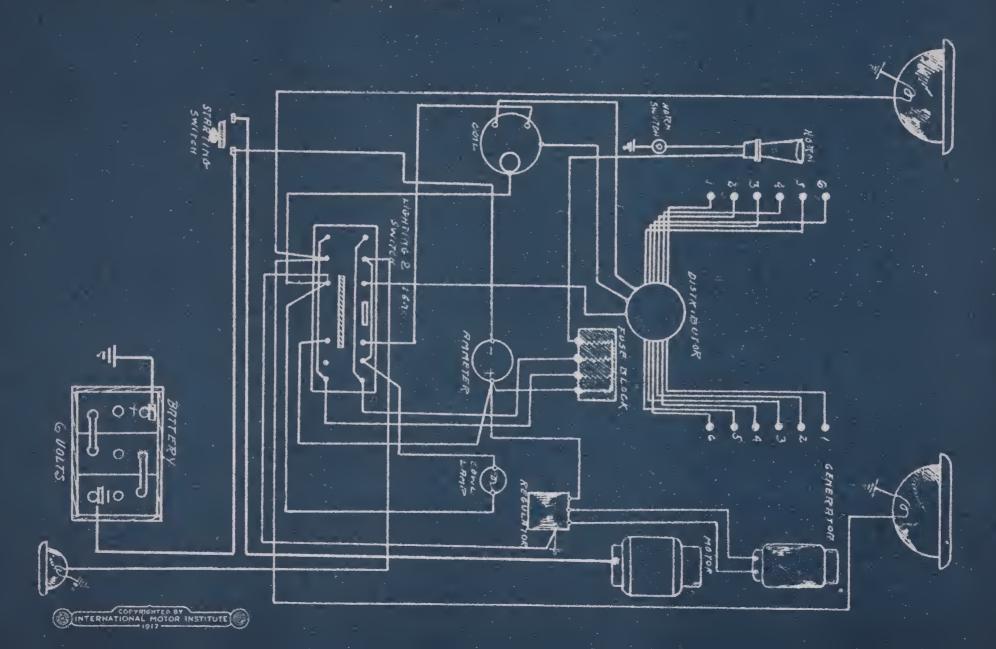
DYNETO FRANKLIN SERIES 9 1917 STARTER & IGNITION WIRING

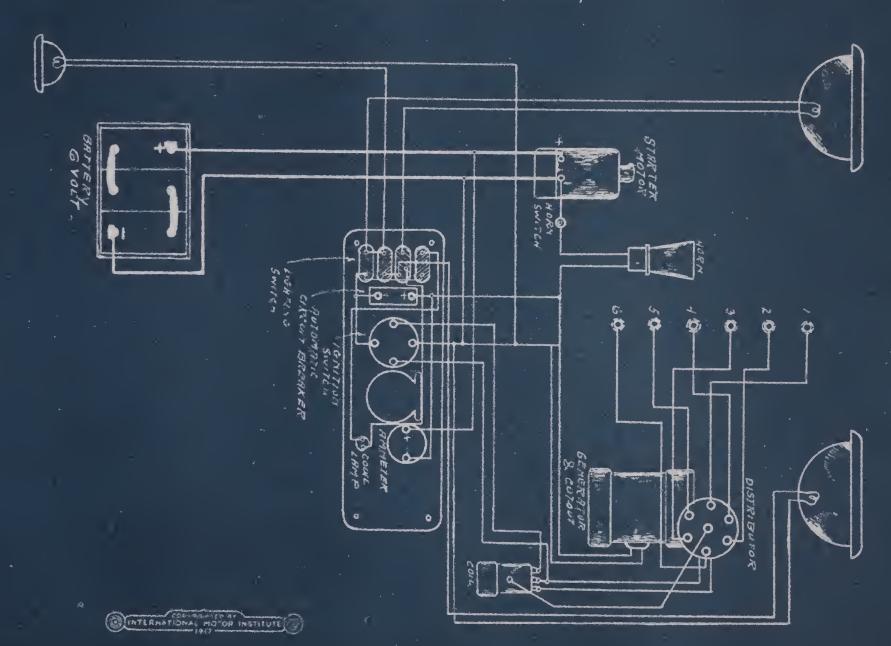


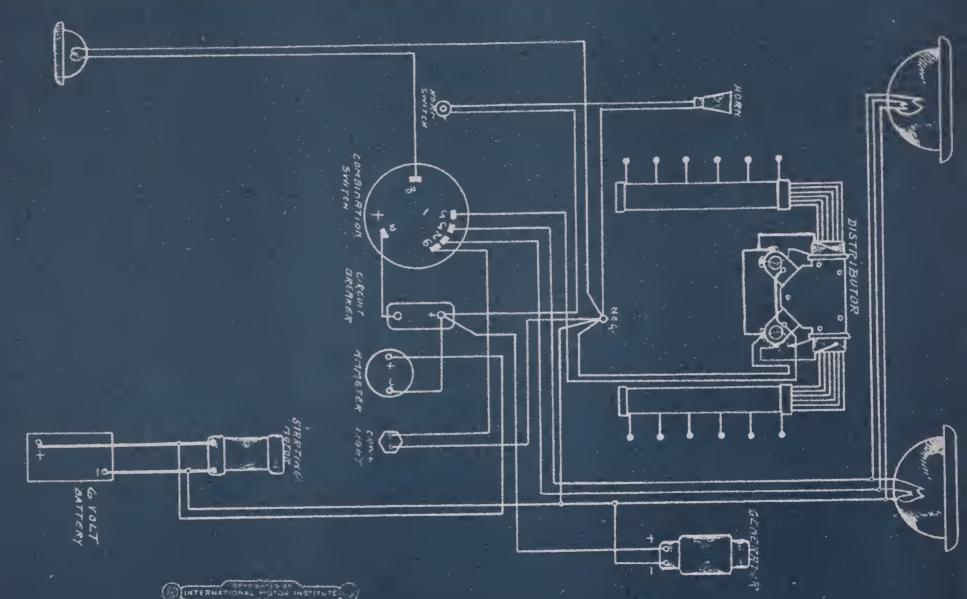
HLLIS-CHALMERS GRANT 4 1915

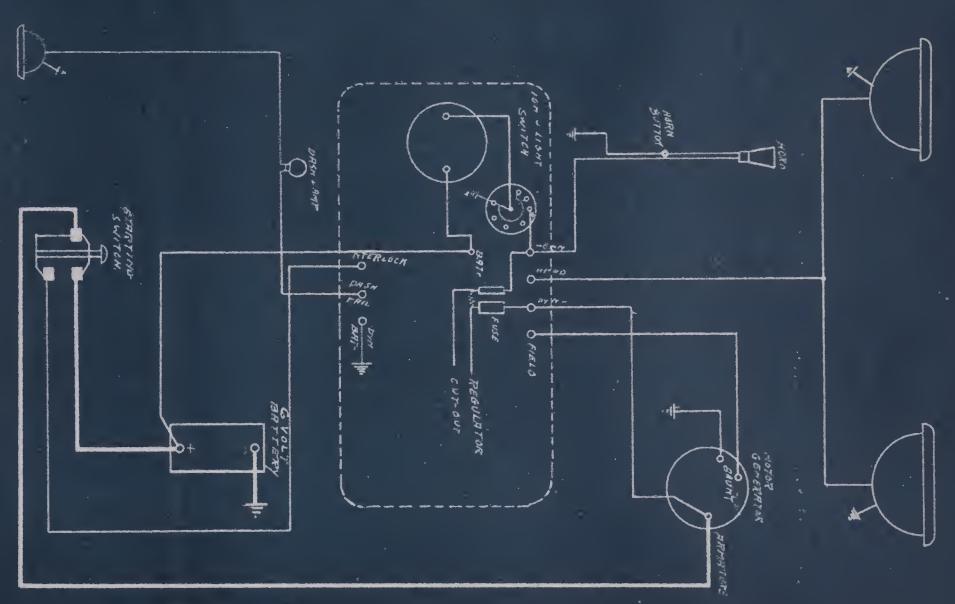




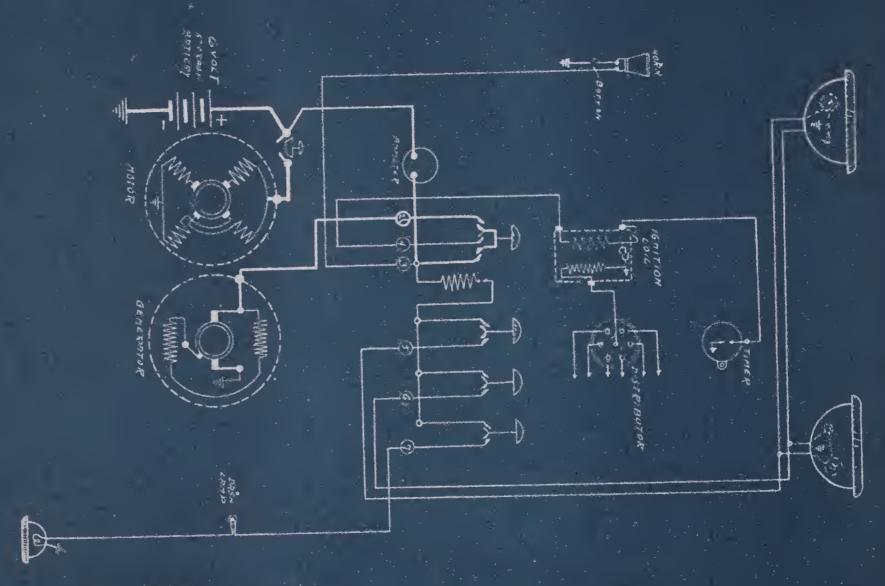


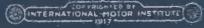




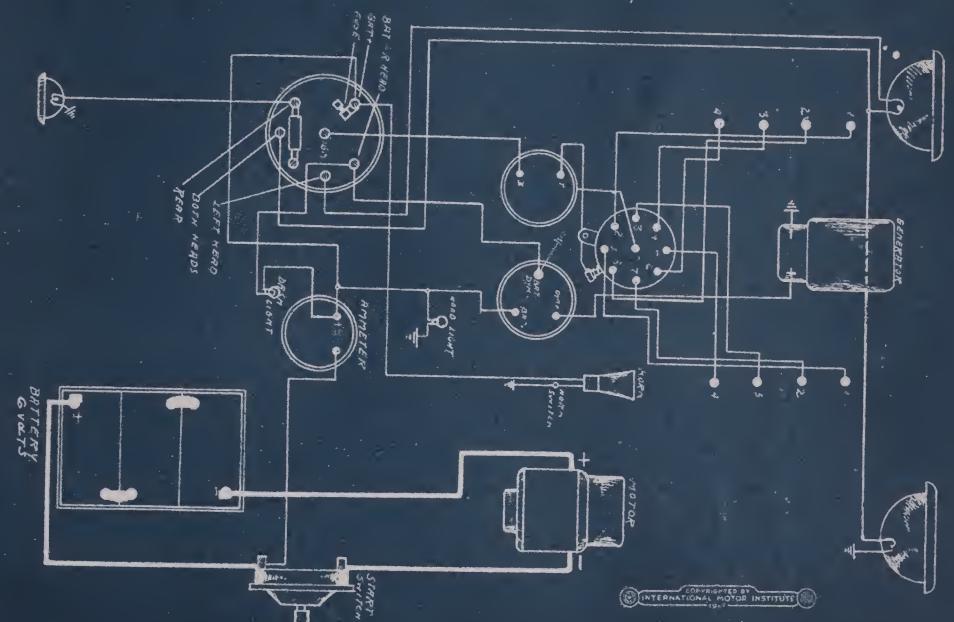


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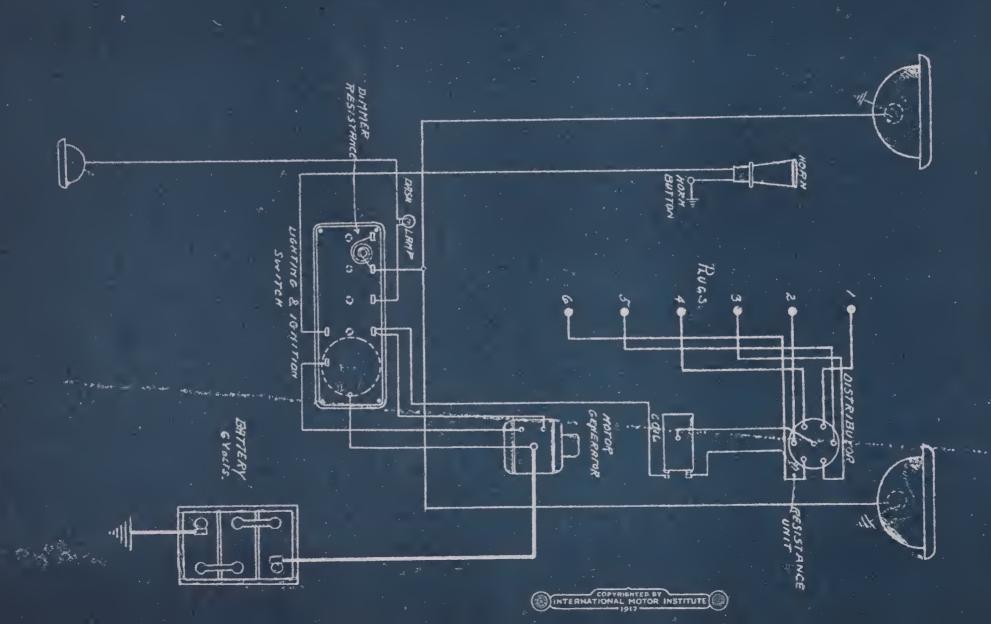


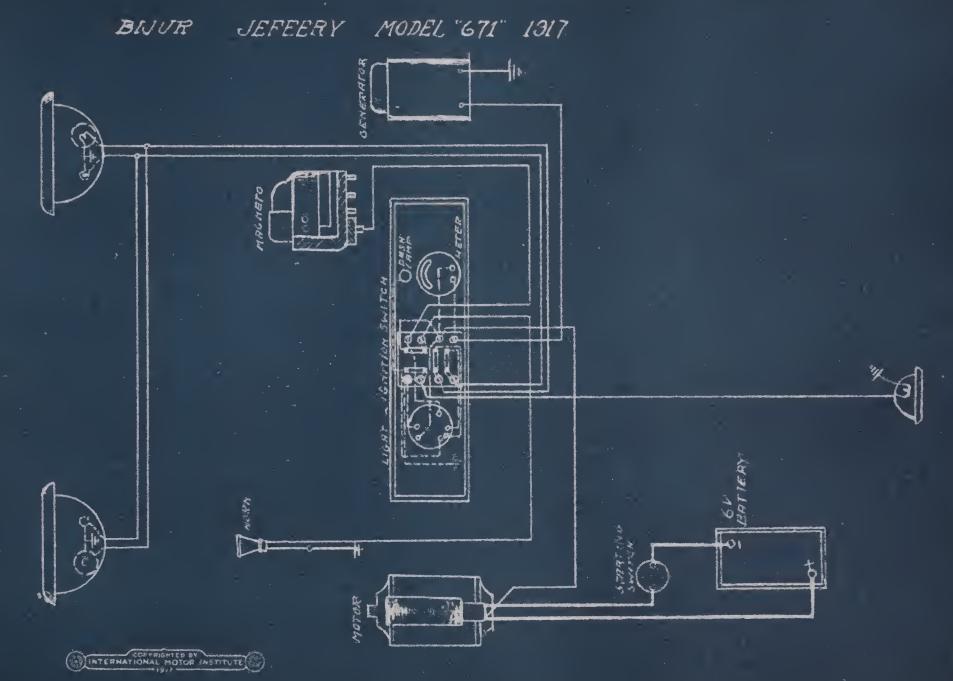


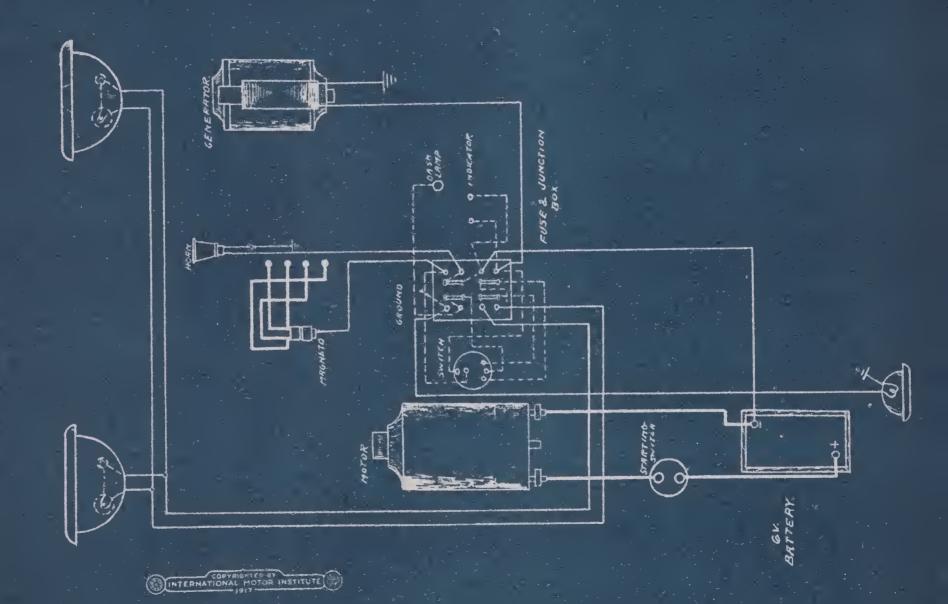
AUTOLITE JACKSON "8" MODEL 349. 1917.



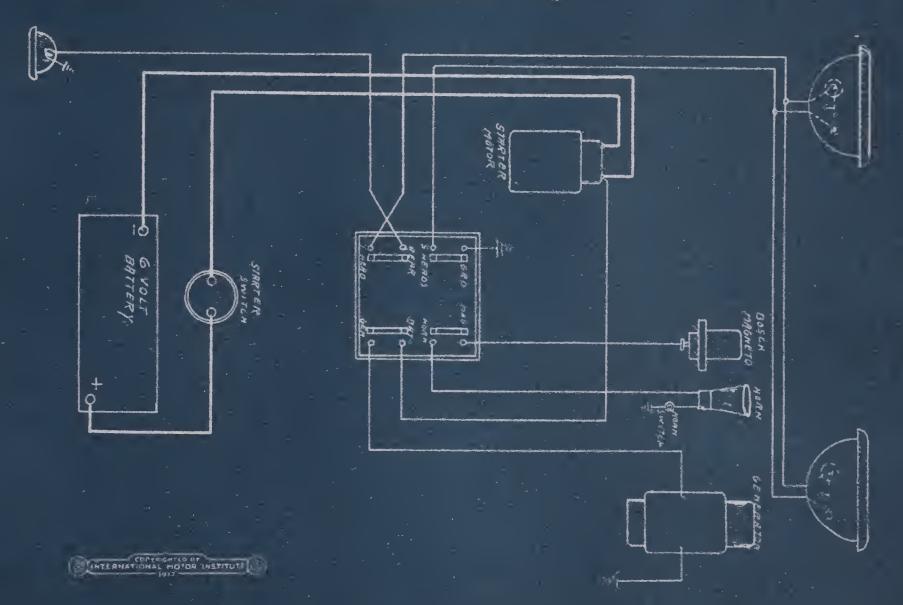
DELCO HUDSON SUPER-SIX 1917

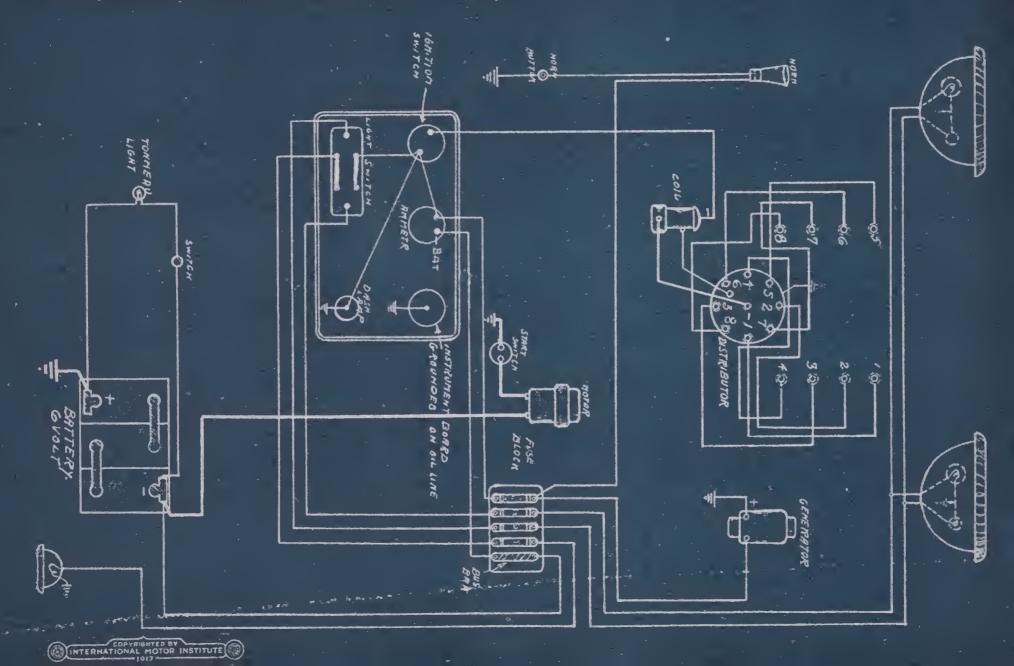




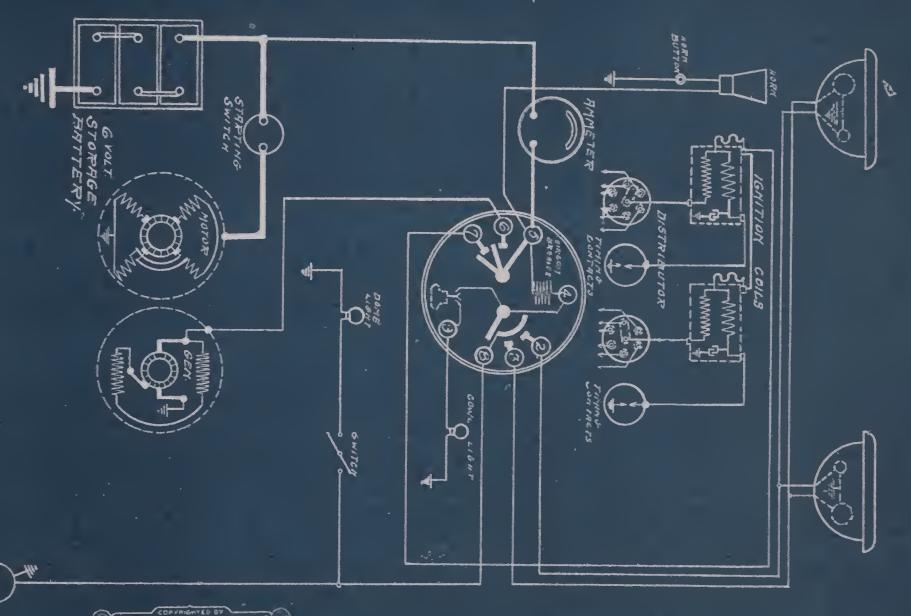


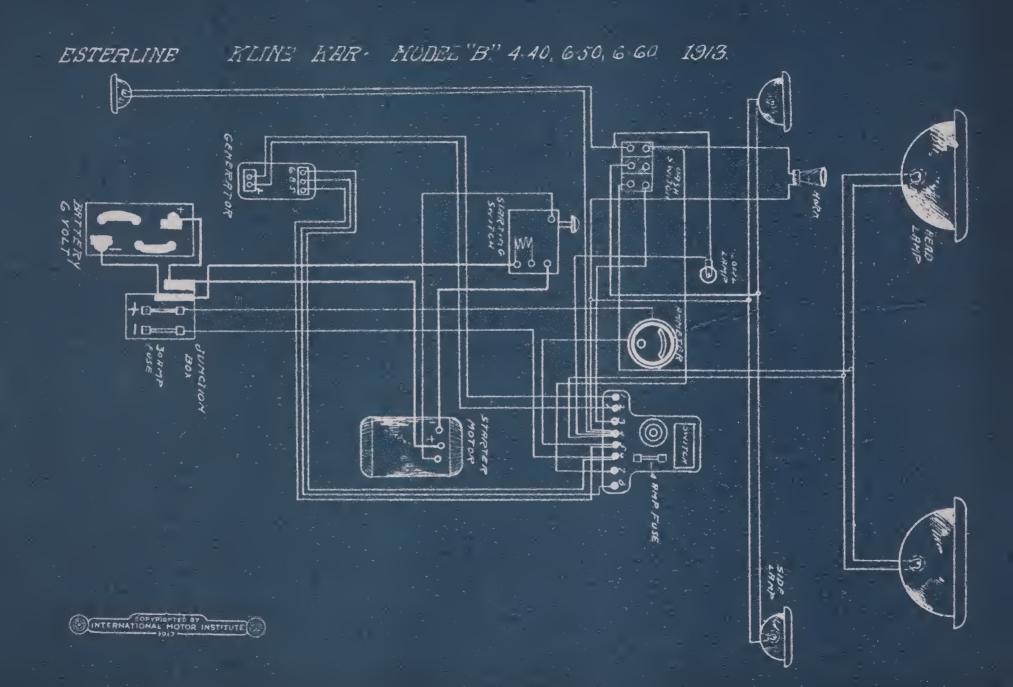
BIJUR JORDAN MODEL 60 1916 - 1917.

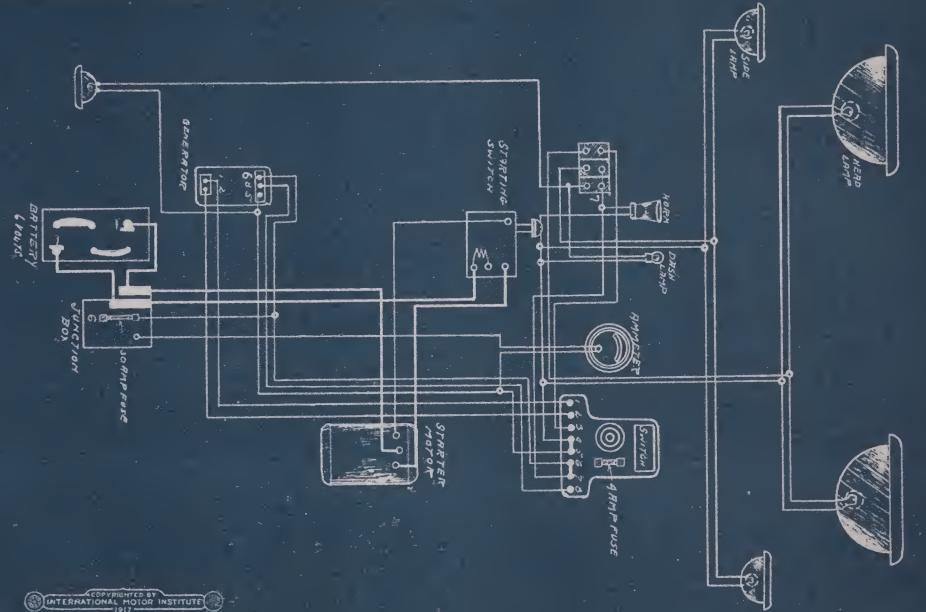


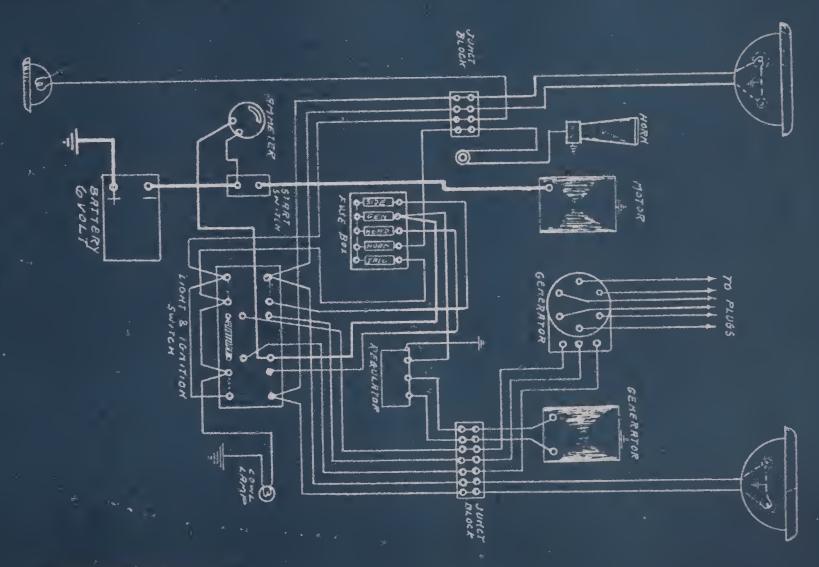


DELCO. KISSEL "DOUBLE SIX" 1917

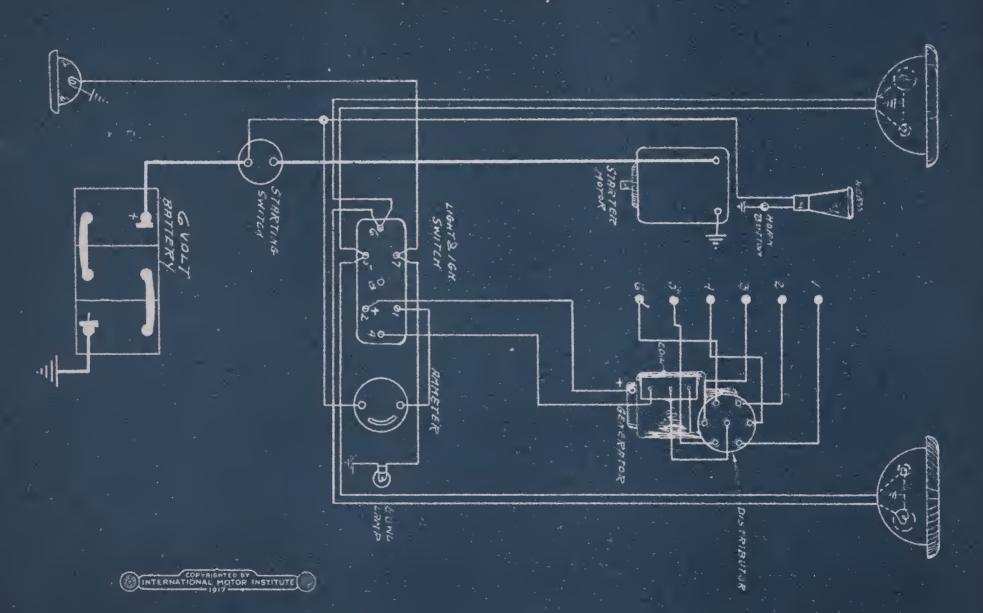


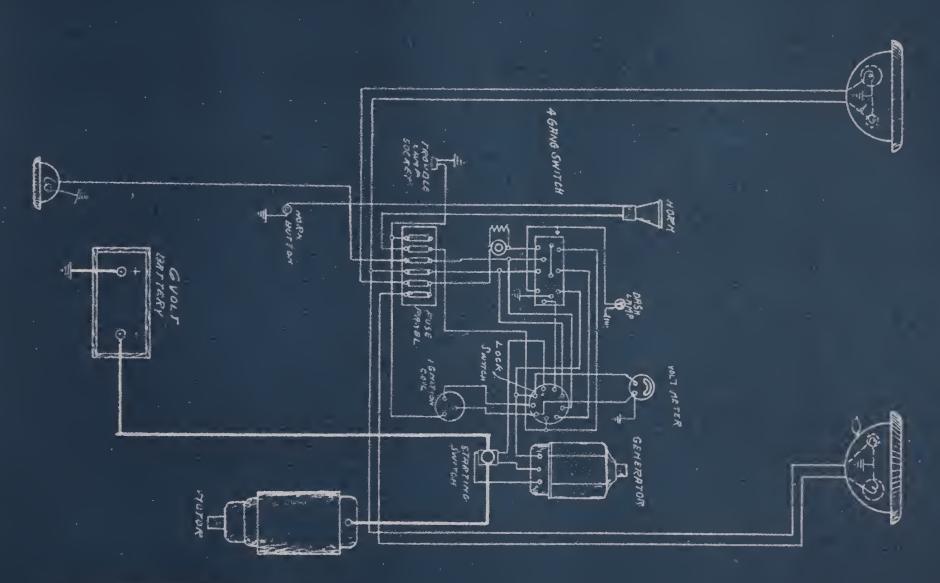


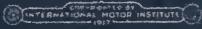


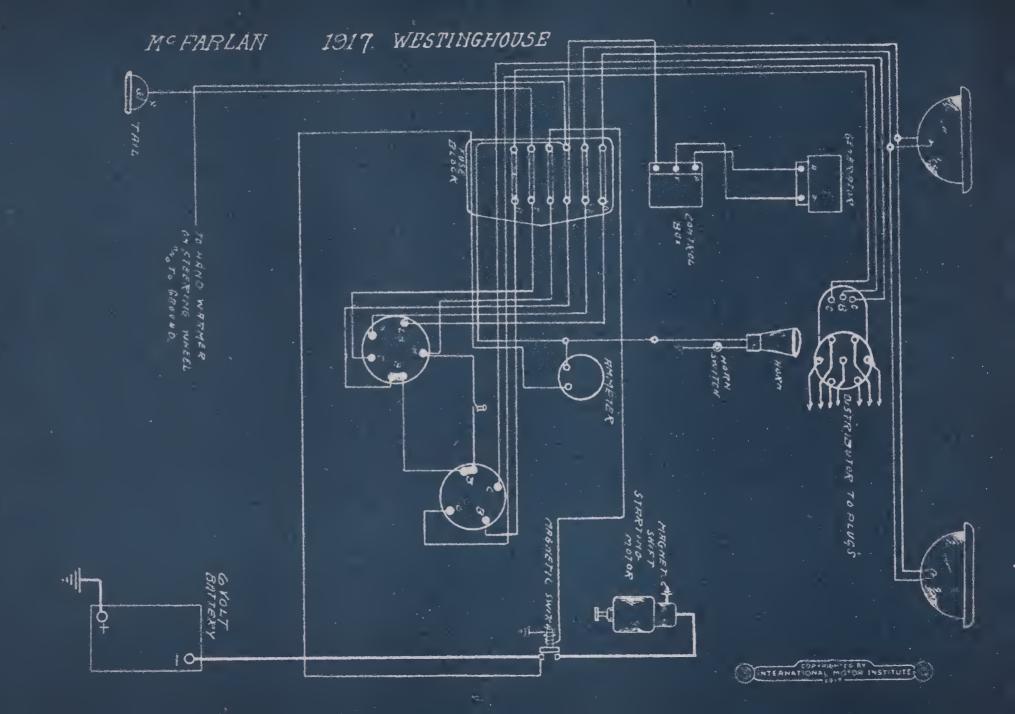


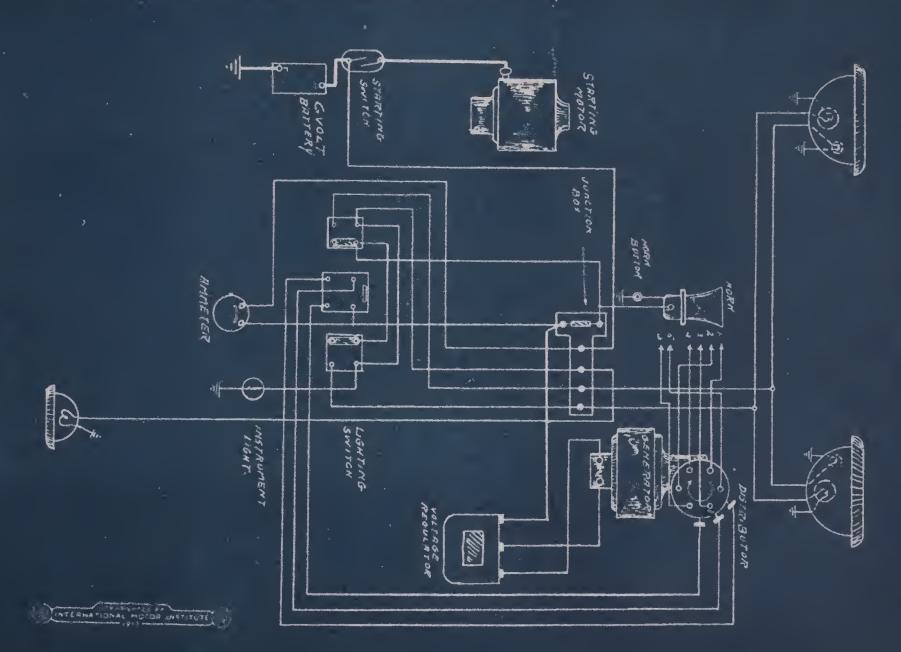
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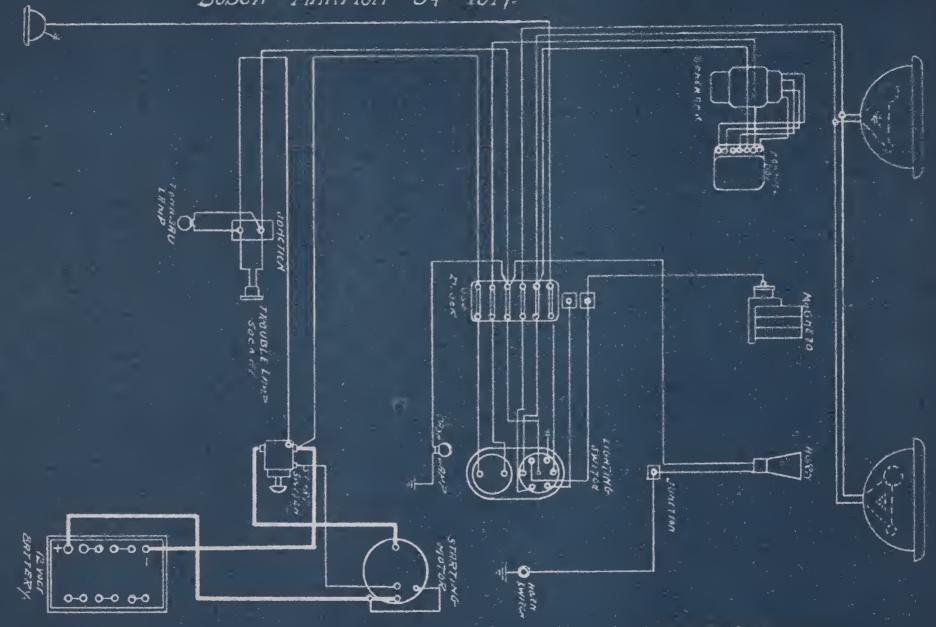




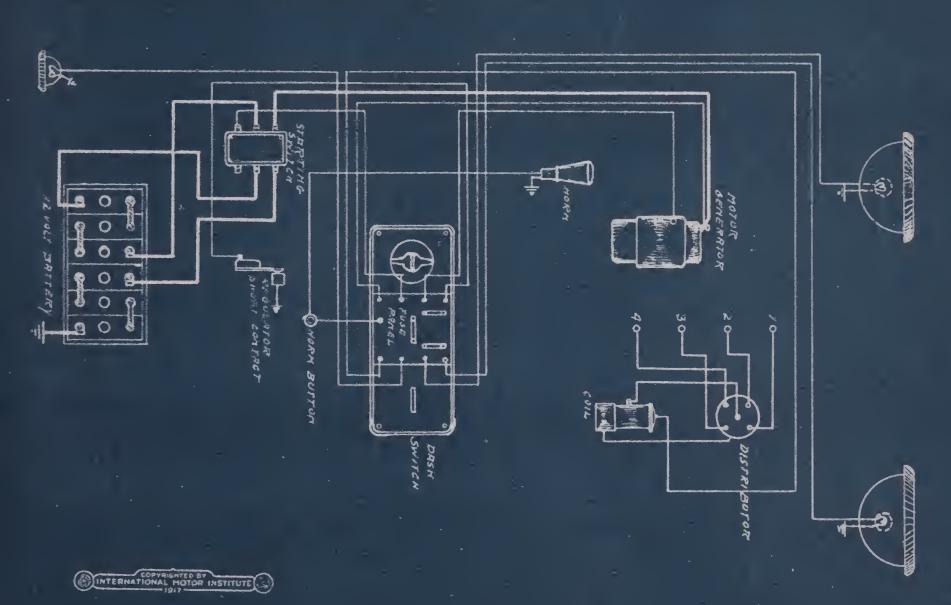


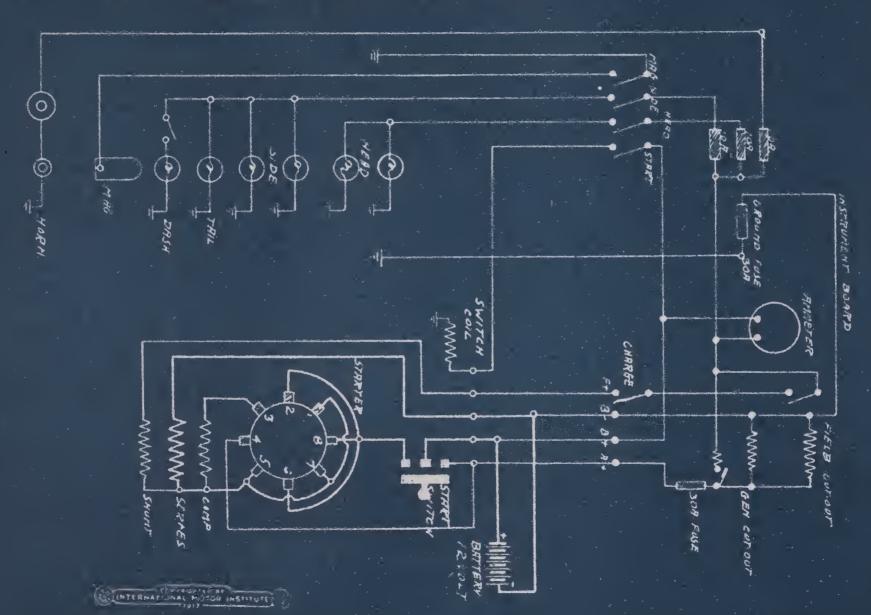




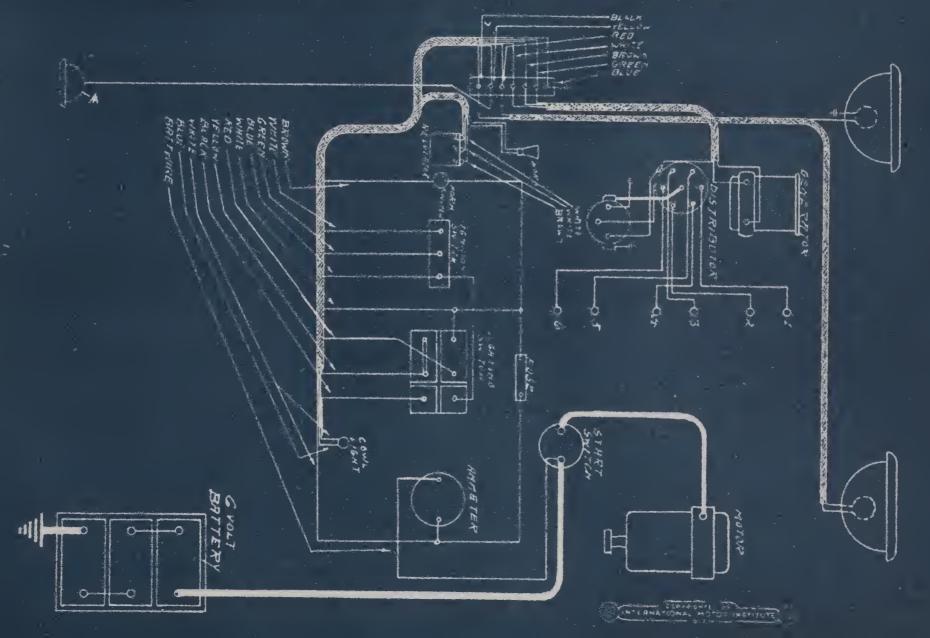


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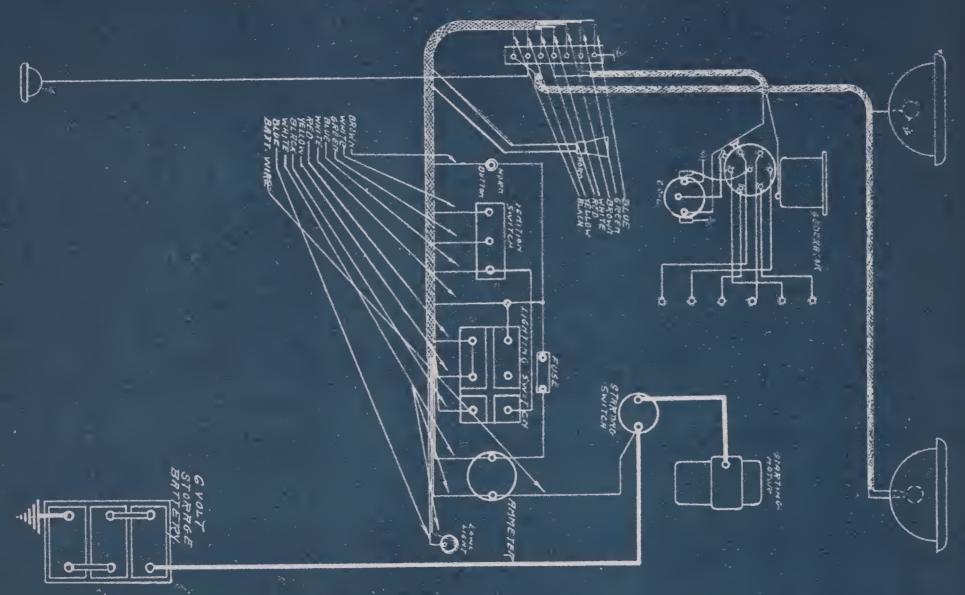




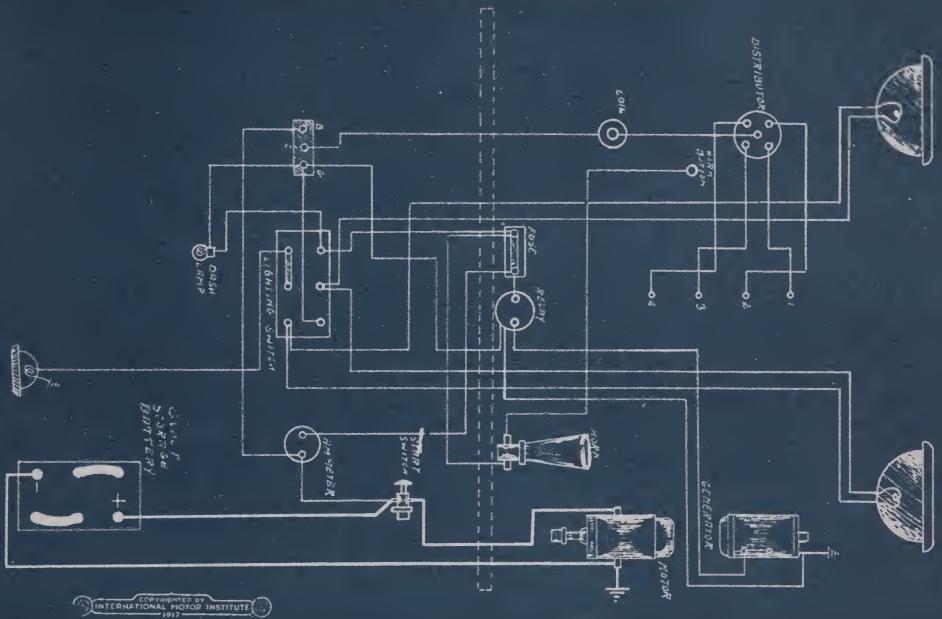
WESTIMGHOUSE MITCHELL MID MEAR MODEL C-42 1916.

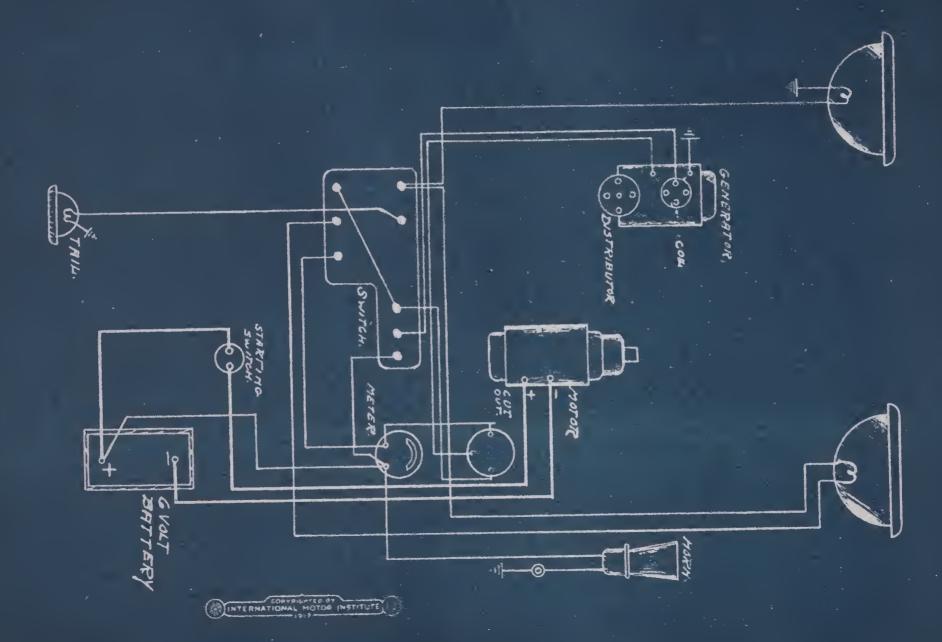


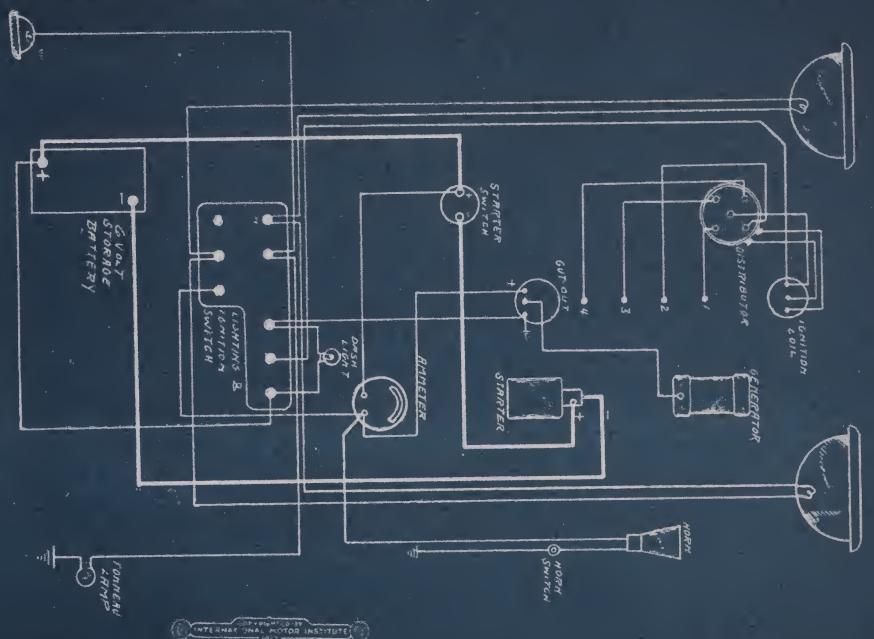
SPLITDORF MITCHELL JUNIOR MODEL D-40" 1917.

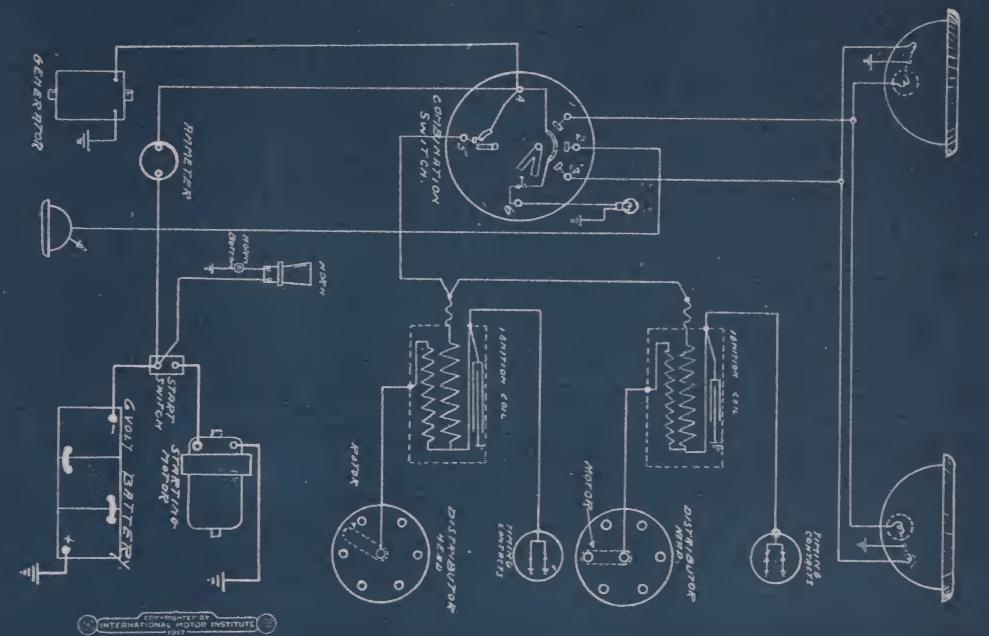


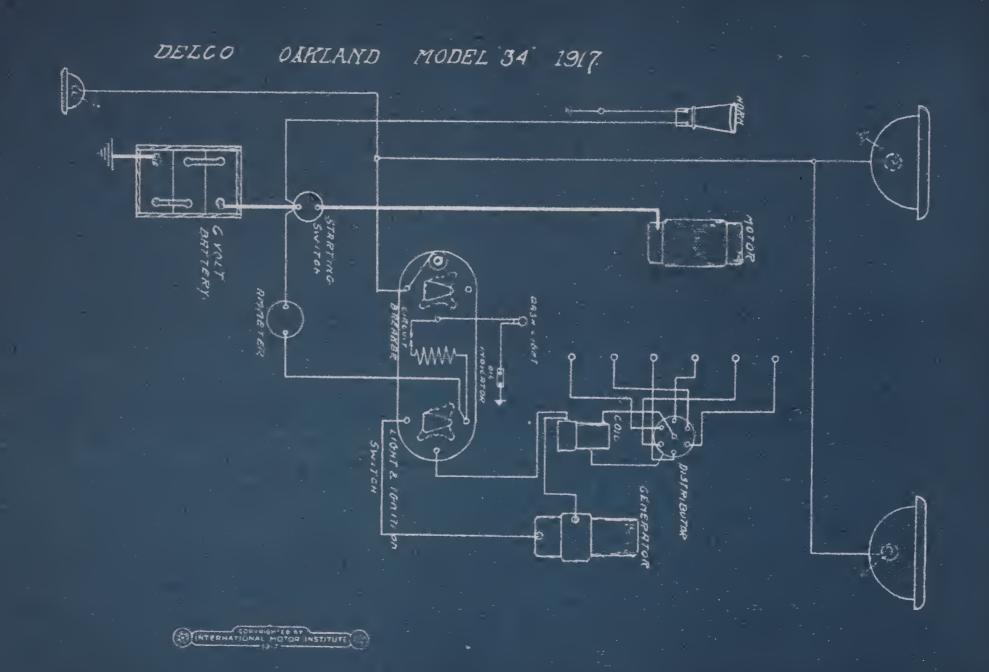
WAGNER MOLINE MODEL MK 40 2 MK 50. 1917.

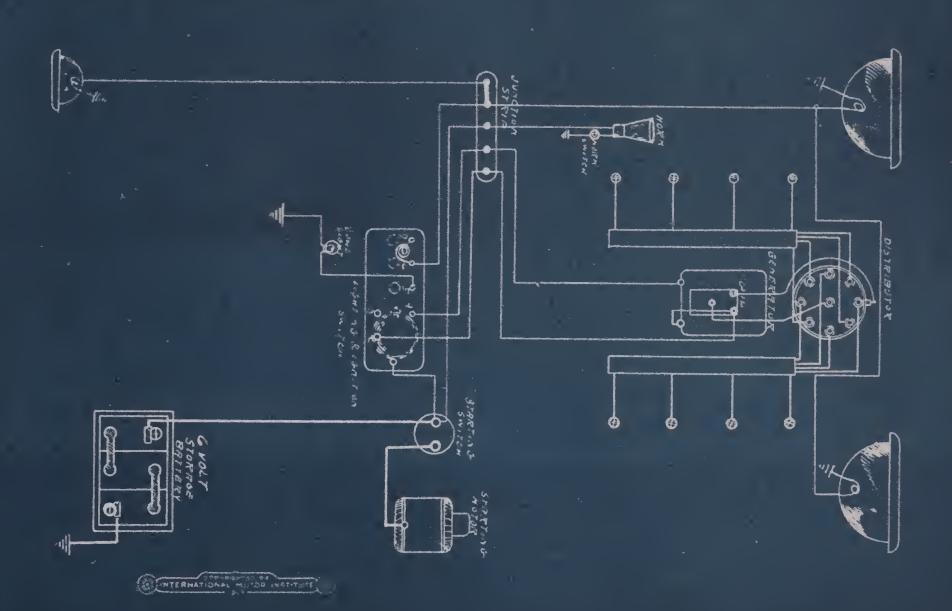


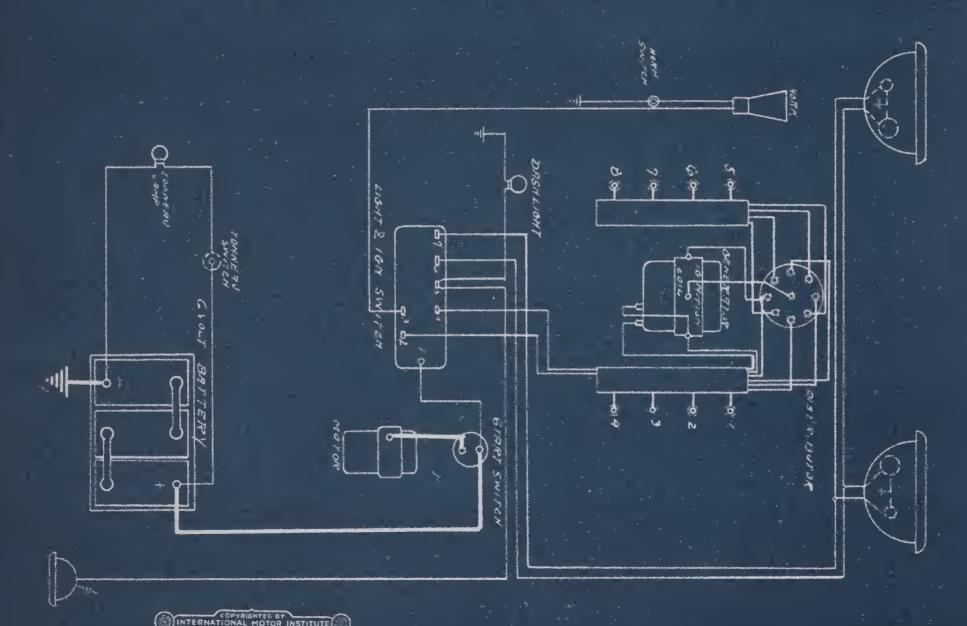




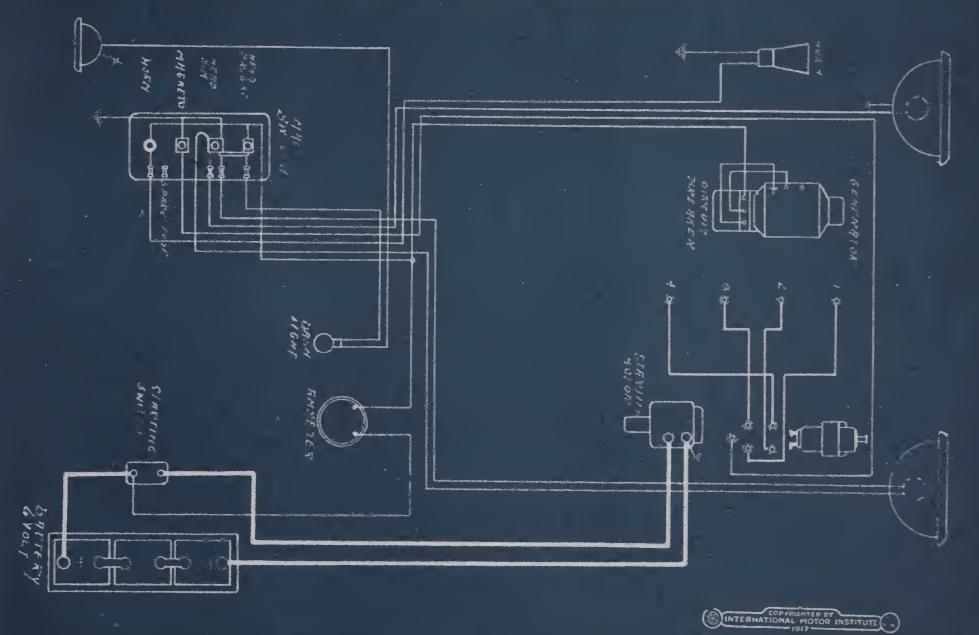




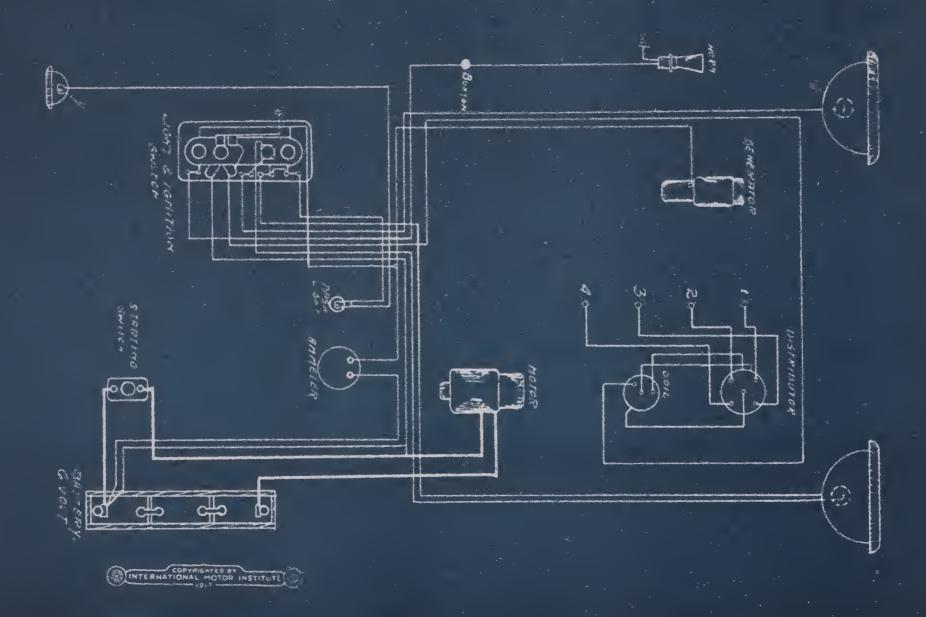


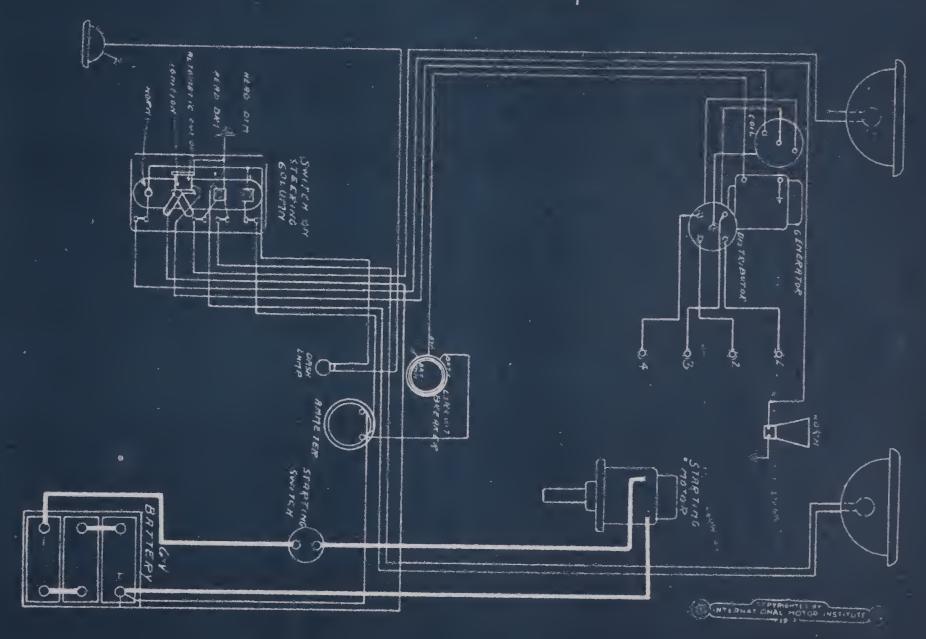


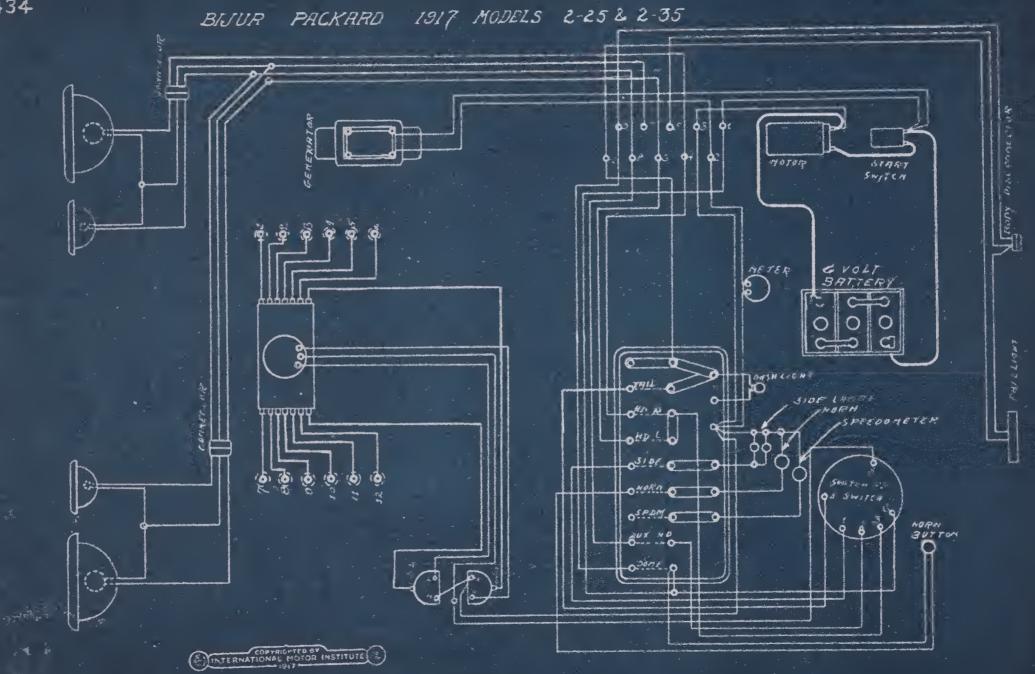
AUTOLITE. OVERLAND MODEL 83B-DE 1916.

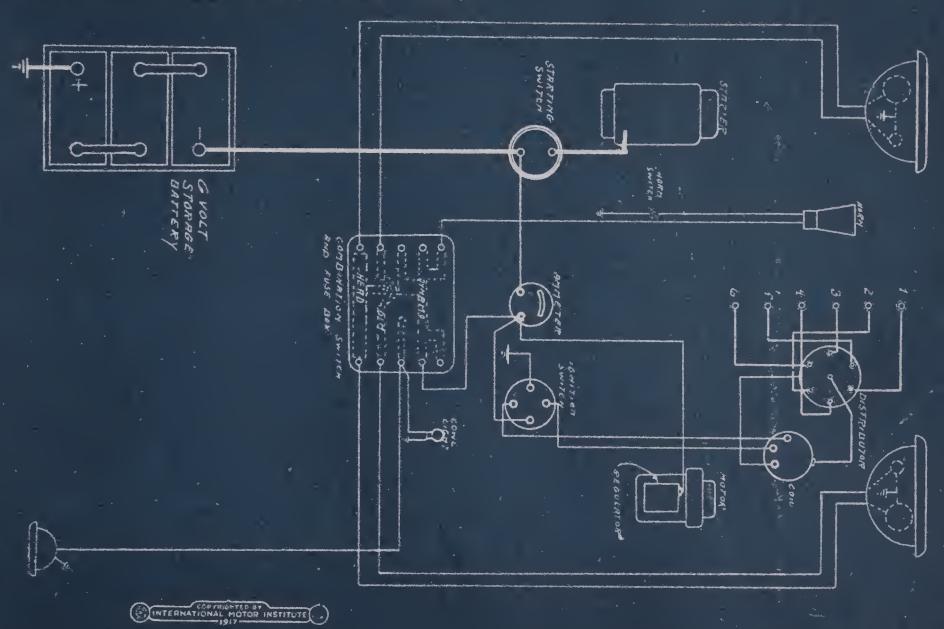


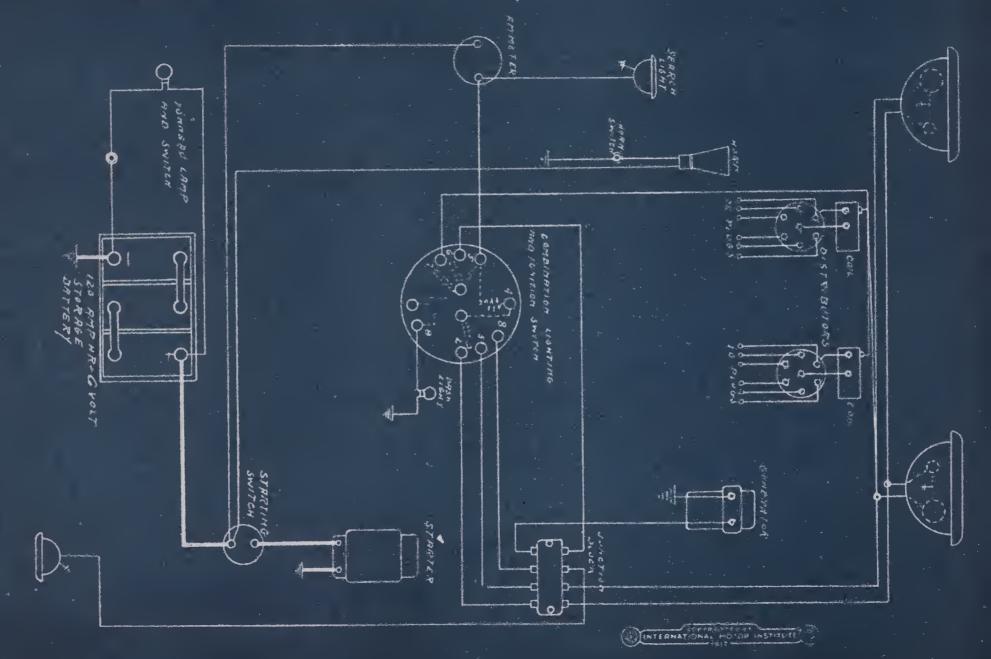
AUTOLITE OVERLAND MODEL 85-1917

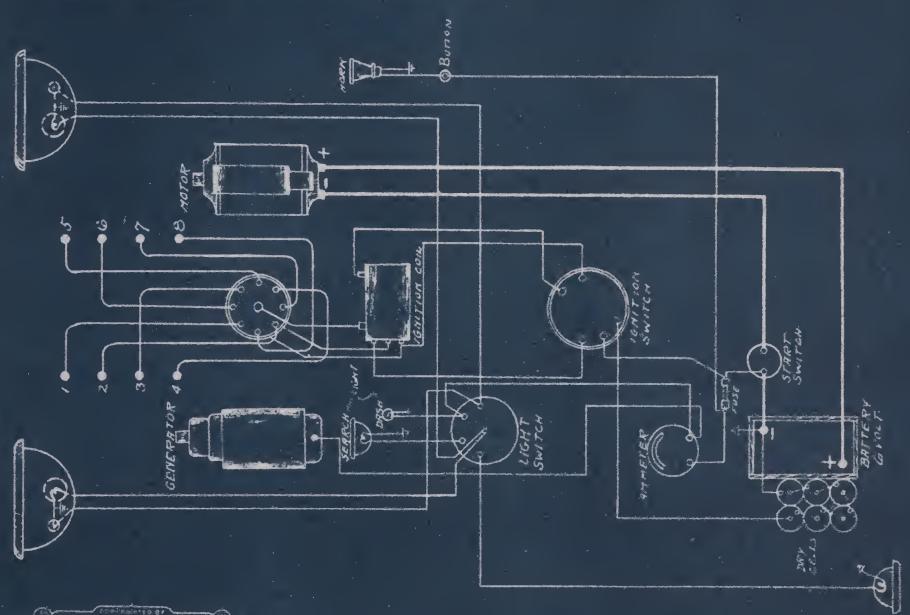


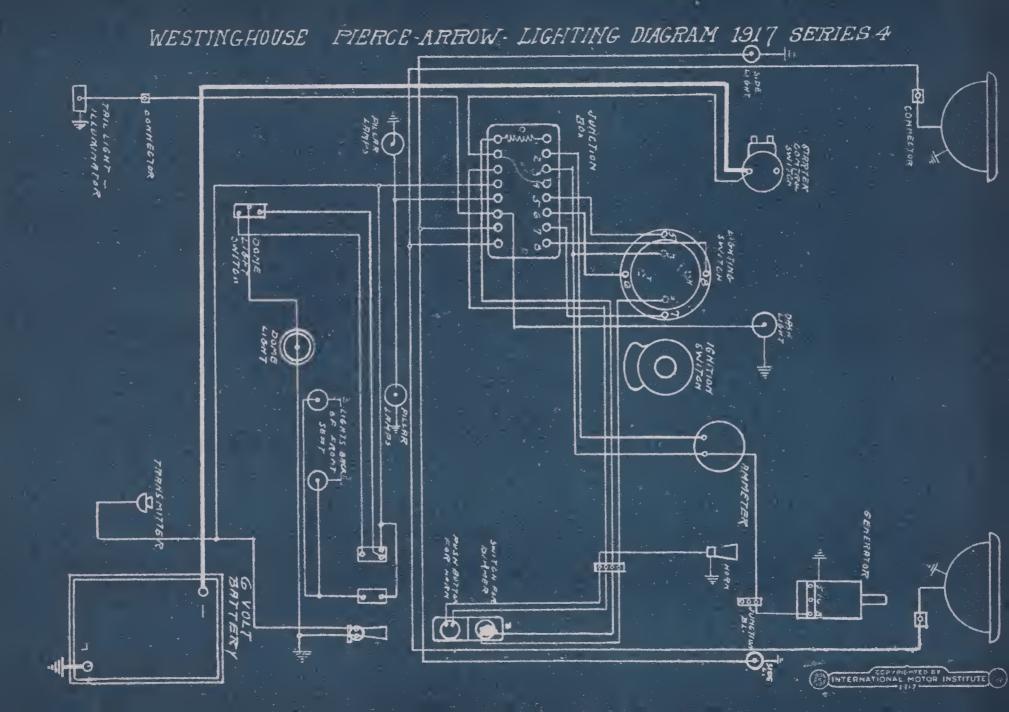




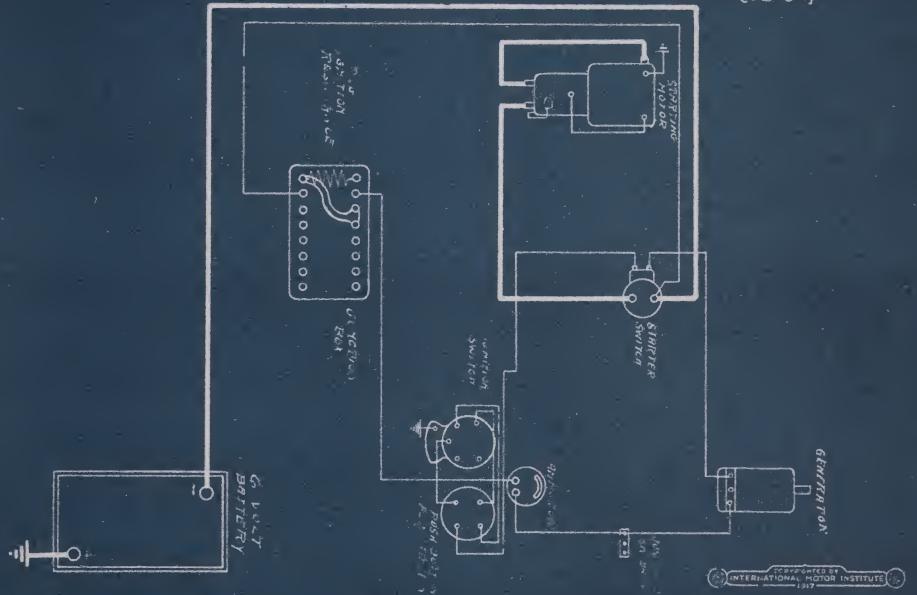


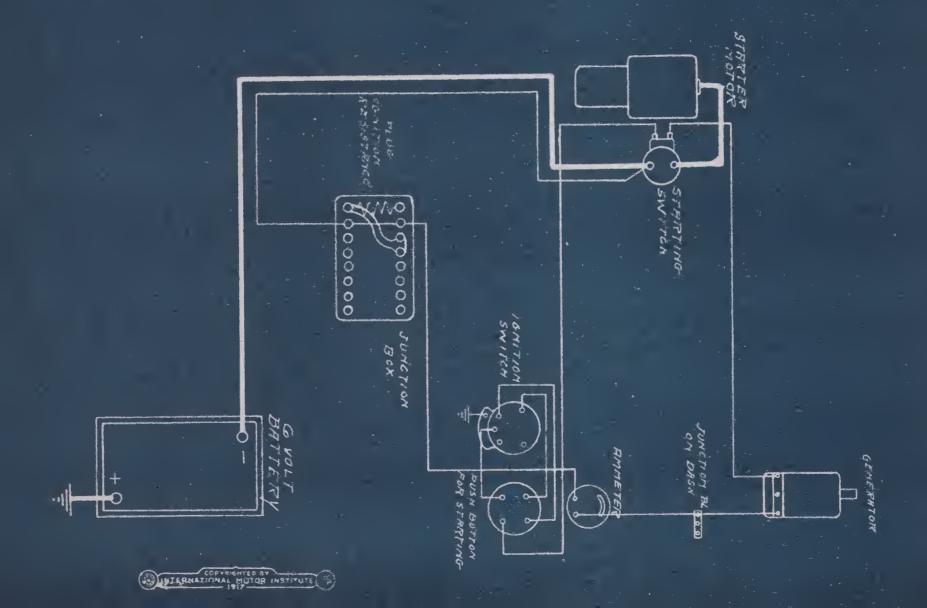


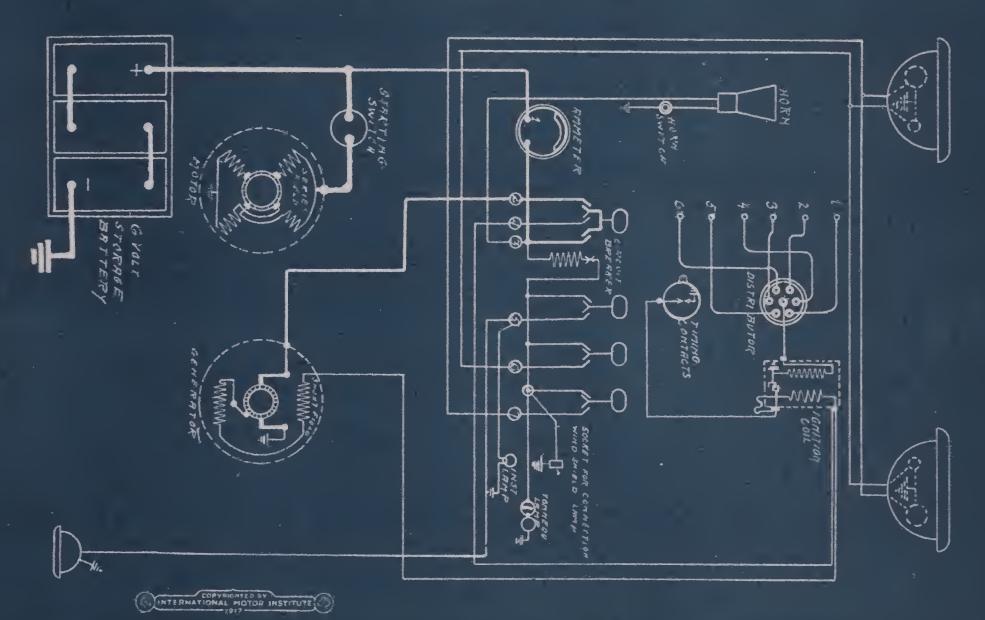


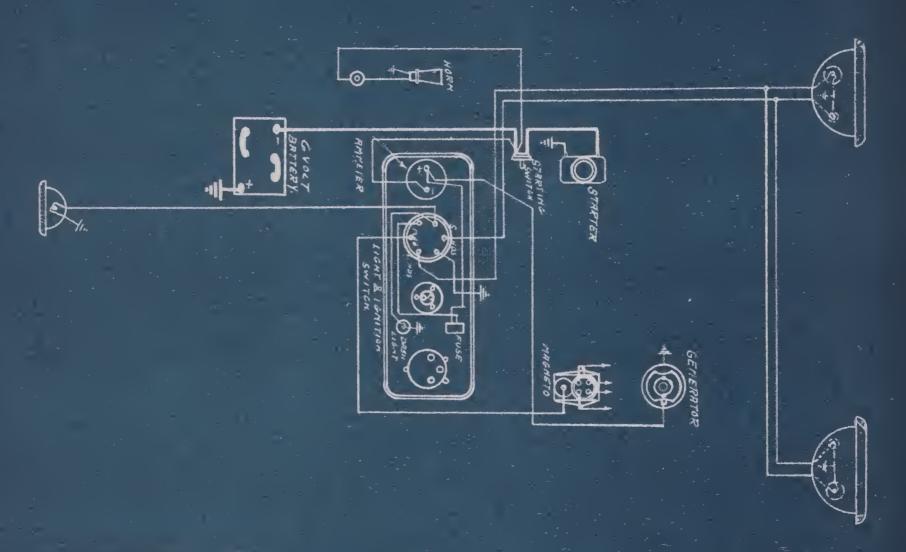


WESTINGHOUSE PIERCE ARROW-STARTING MAGRAPI MODEL 48-13-4 1917.





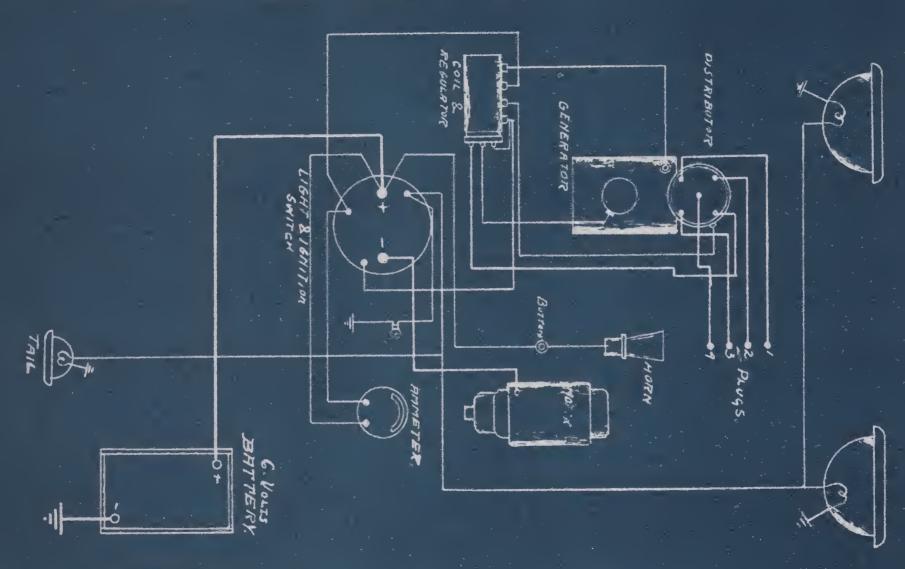




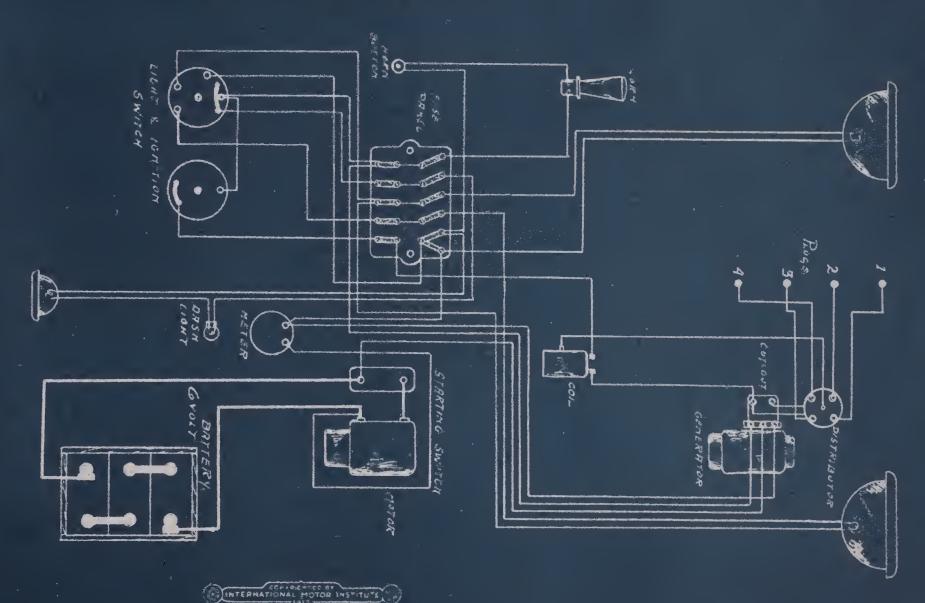


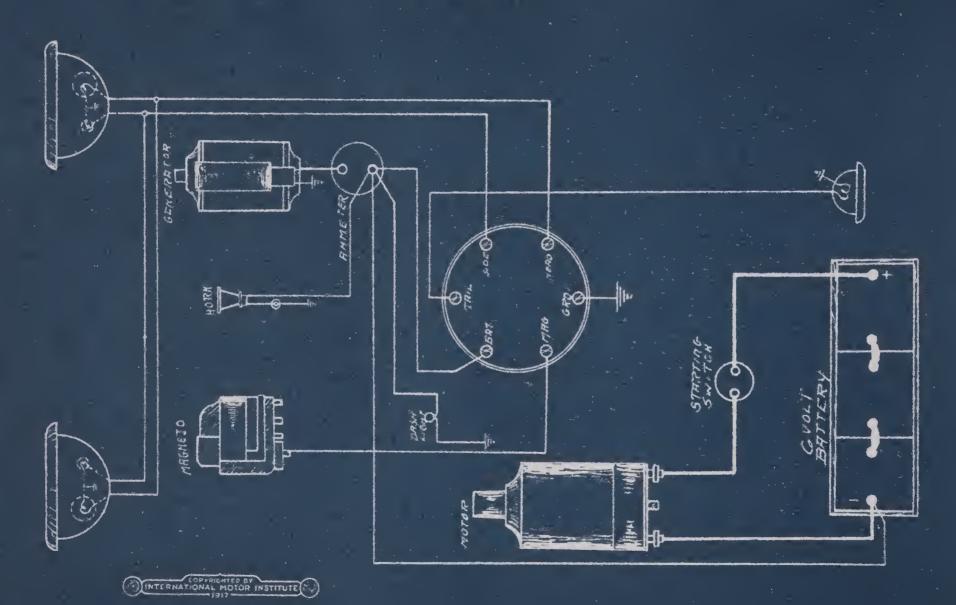
DYNETO REGAL. MODEL F 1917. DASH GLAM

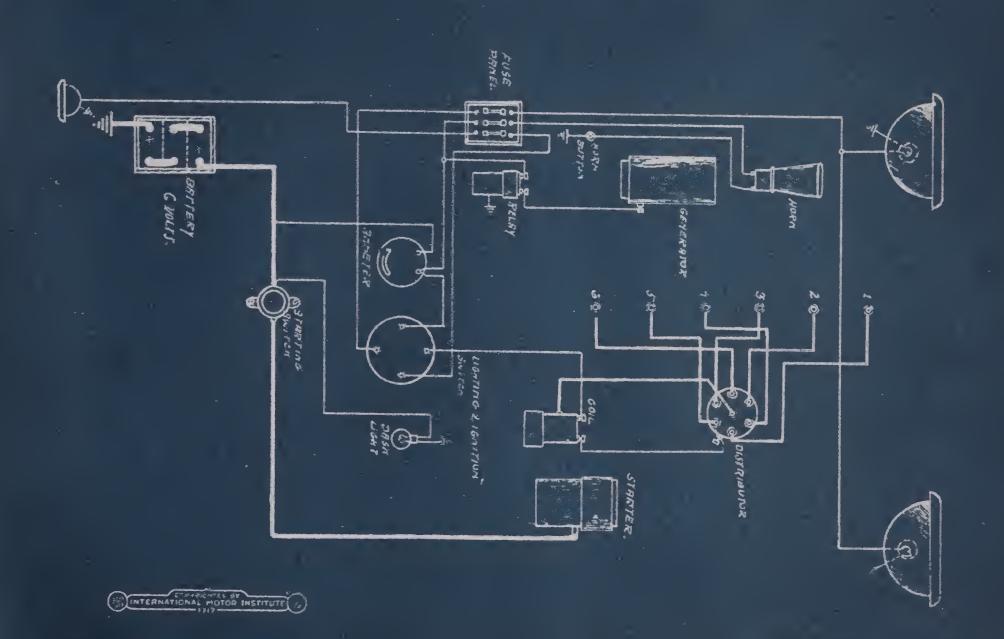
HEINZE REGAL MODEL J" 1917



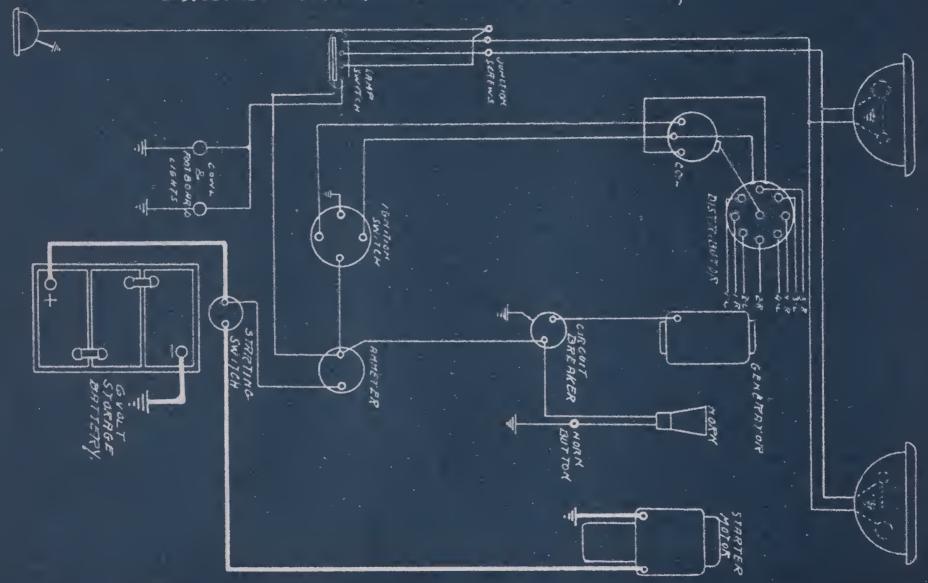




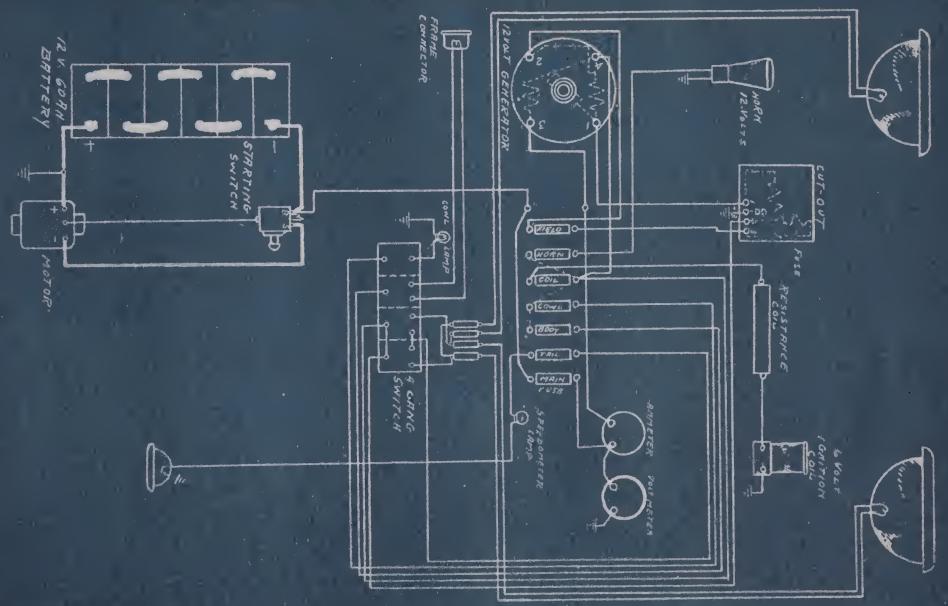




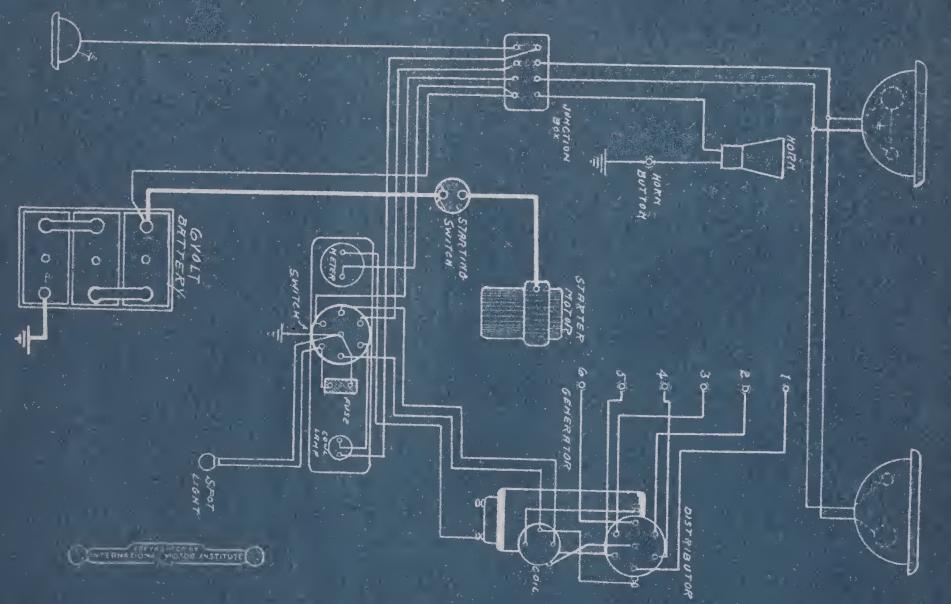
WAGNER SCRIPPS-BOOTH MODEL D 1917

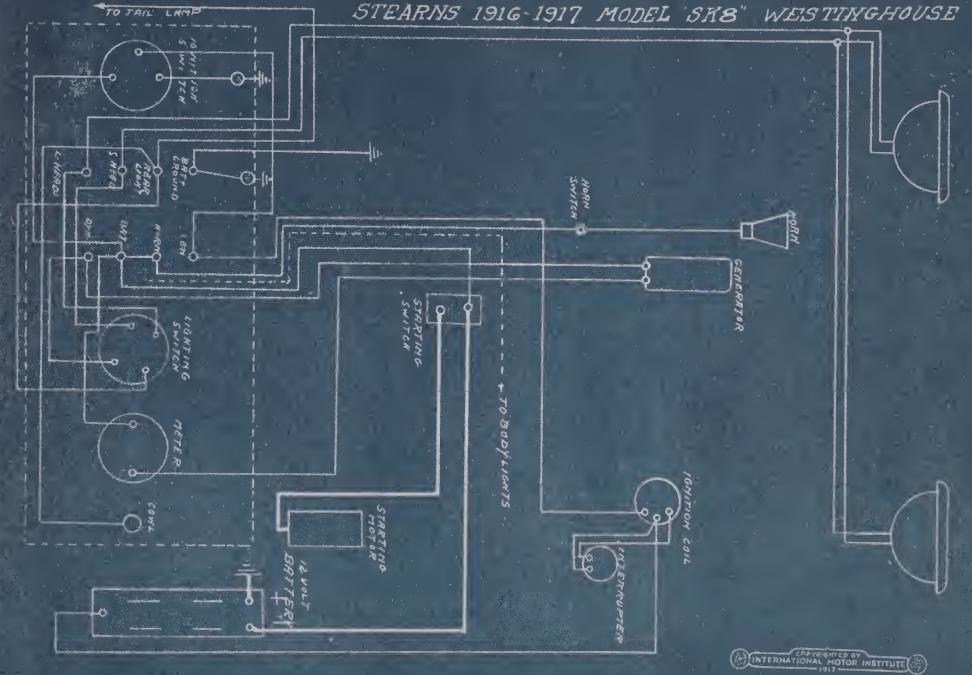


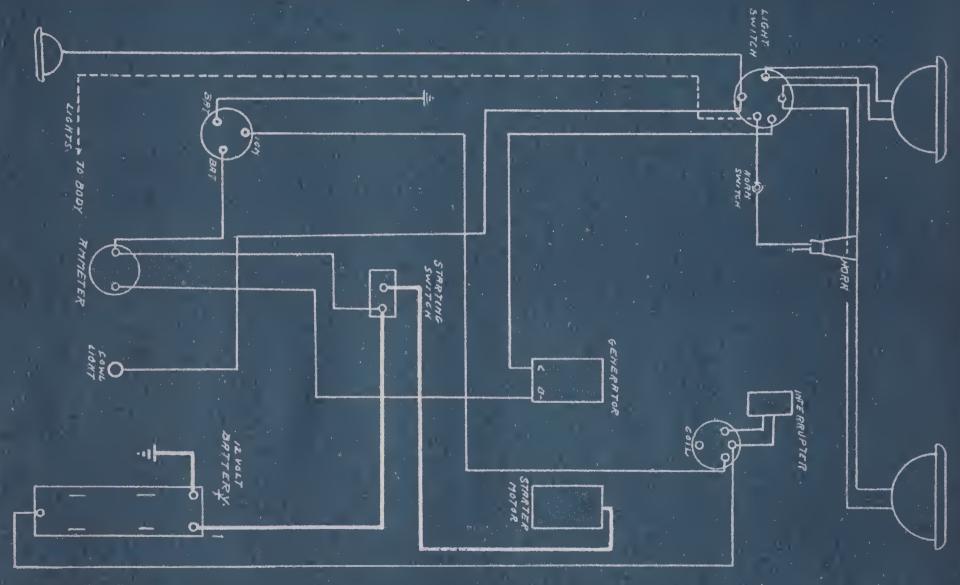




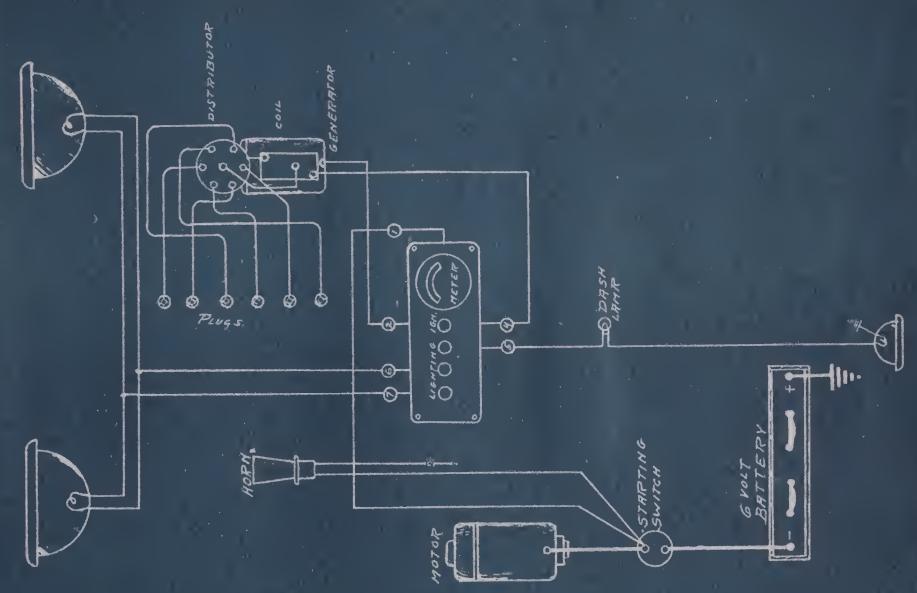
() INSTRUCTIONAL MOTION INSCRIPTION



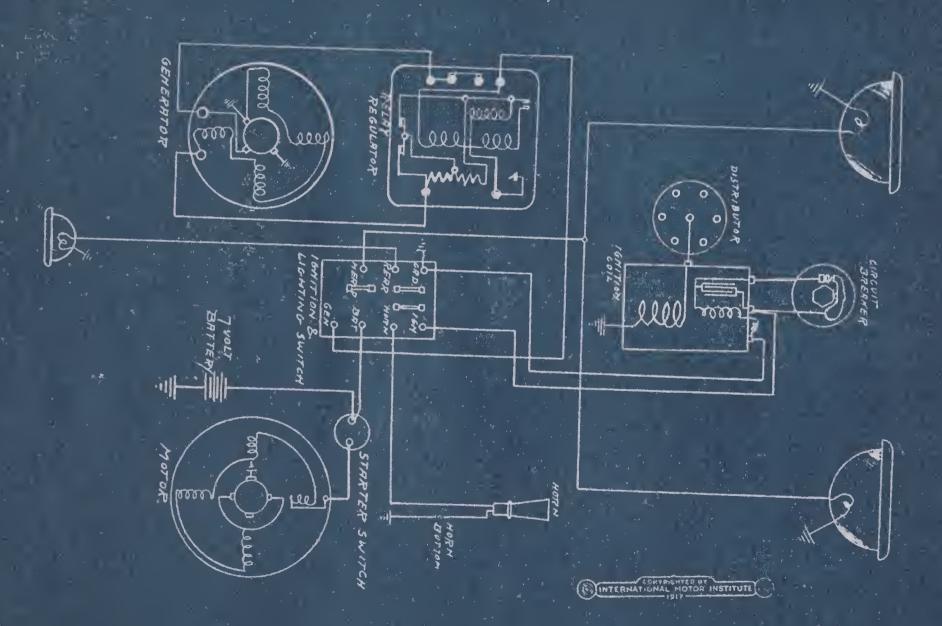


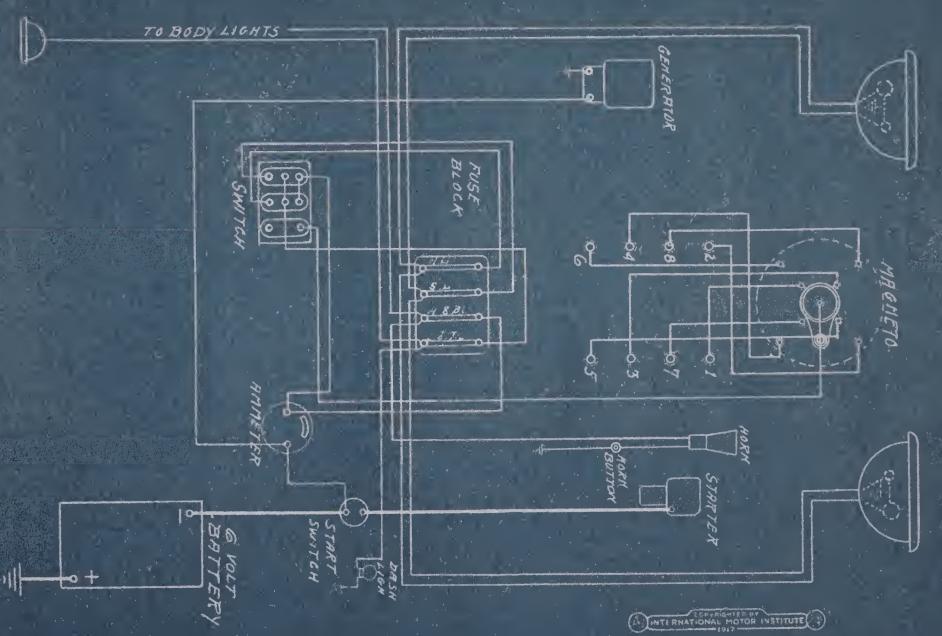


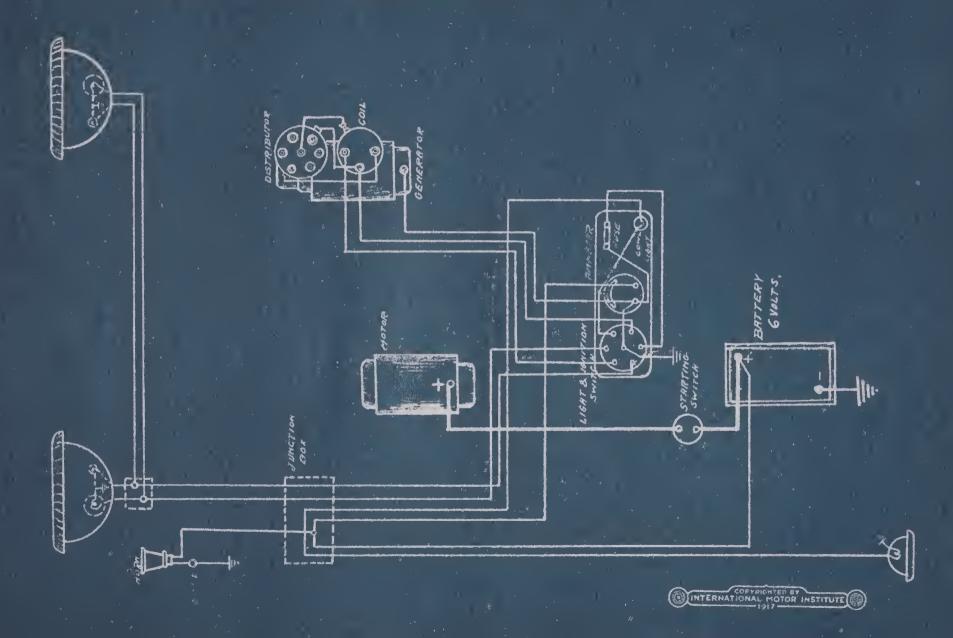


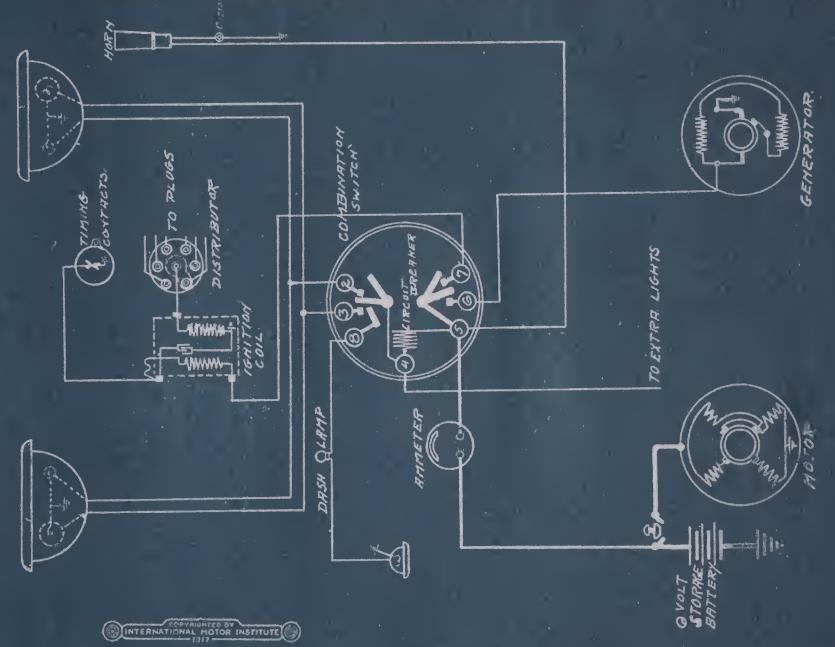


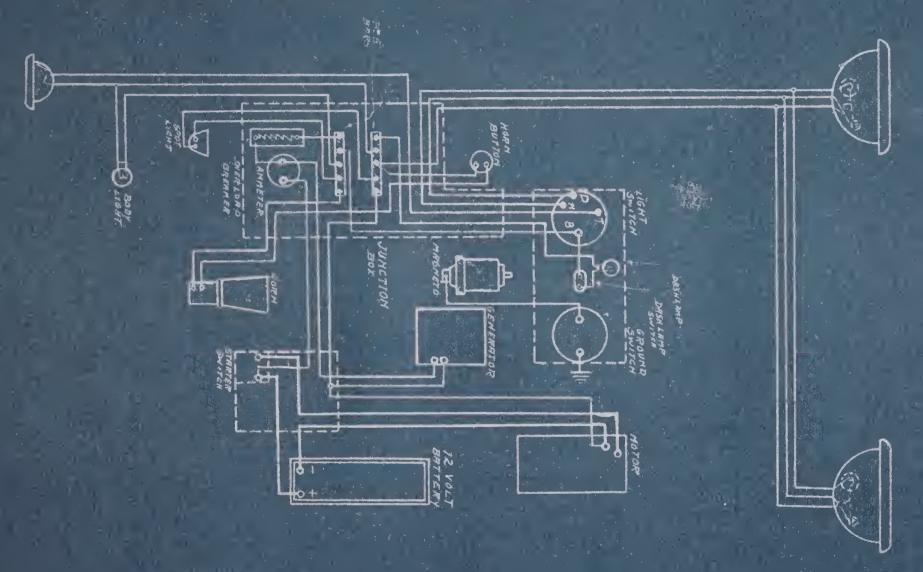
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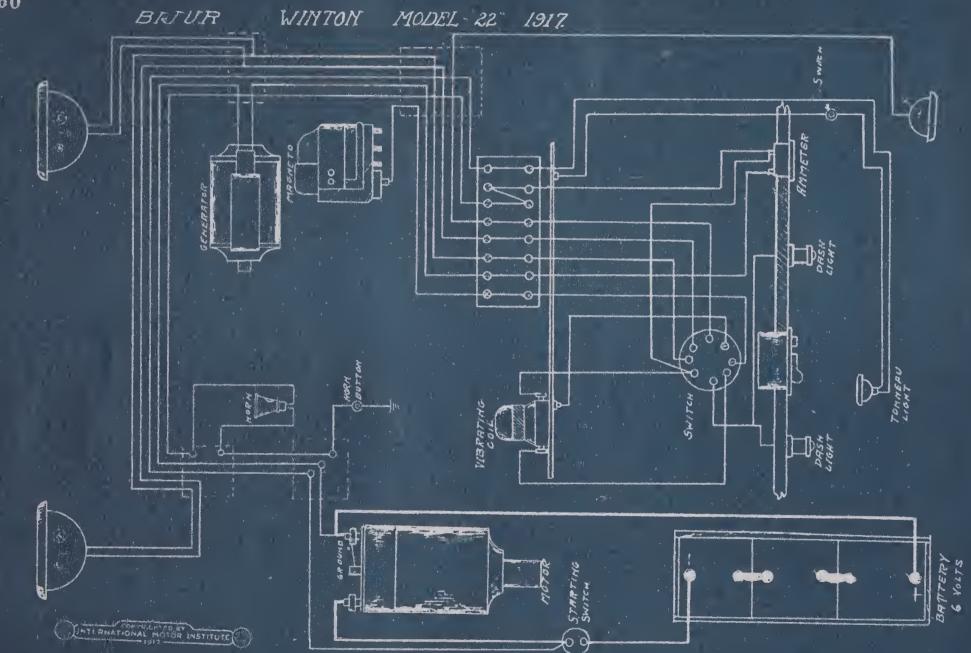






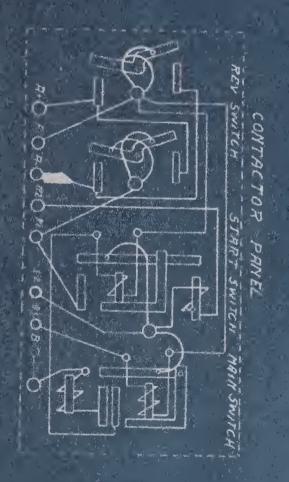


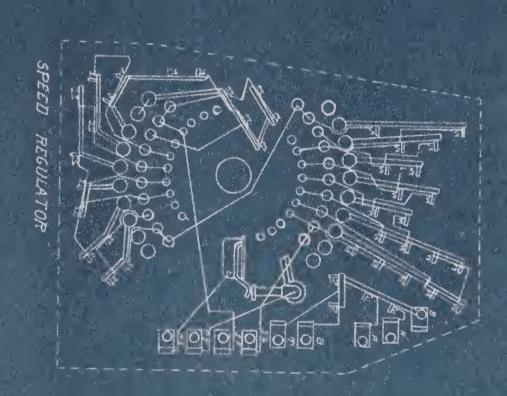
AUTOLITE WILLYS KNIGHT MODEL 88 8T 1917 INTERNATIONAL HOTOR INSTITUTE



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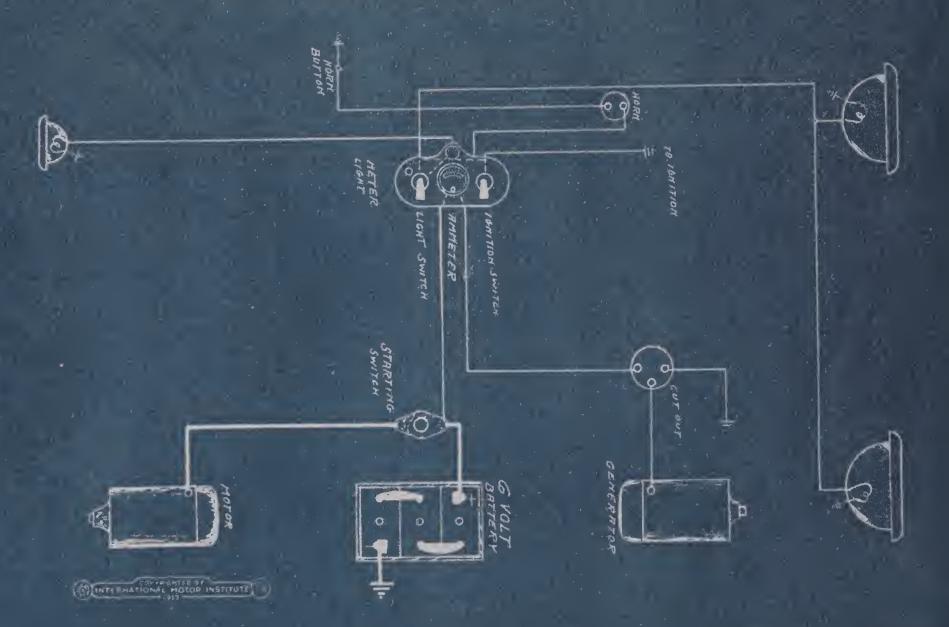
WOODS BURL POWER MODEL 1600 1917 DETRILS OF CONTRCTOR PHATE AND SPEED REGULATOR







DISCO YALE - 1917 MODEL K-8



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